TROPICAL AGRICULTURE

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CONTENTS.

	PAGE.
Empire Produce	217
British Guiana	218
Efficient Agriculture	219
Agricultural Notes	221
Enemies of Books	223
Cotton Research Station	225
"Starving Out" the White Ant	227
Tropical World Notes	228
Claude Tinné Berthon	230
The Isoelectric Theory	231
Chemical Notes	234
Correspondence	235
The College	235
The West Indies	236
The Colonial Office	237
Book Reviews	237
College News	239
Trend of the Markets	240
Indian Tea	240

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THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, ST. AUGUSTINE, TRINIDAD.

EMPIRE PRODUCE.

ON December 17th, 1924, the Rt. Honourable S. Baldwin in announcing that the Government proposed to establish an "Imperial Economic Committee," stated that, "The Dominions have always recognised that our home producers have, and always should have, the first place in the home market. Now they ask, and we think rightly ask, that they should have a preference over foreign countries as regards that part of the home market which cannot be supplied by the home producer." The Terms of Reference of the Committee were made known on March 6th, 1925, and the first report has recently been published. The Committee has considered the possibility of improving the method of preparing for market and marketing within the United Kingdom, the food products of the Overseas parts of the Empire, with a view to increasing the consumption of such products in the United Kingdom in preference to imports from foreign countries, and to promote the interests both of producers and of consumers. No one, we think, will deny the prerogative of the Home Country, but it must be clearly recognised that, however much the production of the United Kingdom may be increased, there still must remain a considerable deficiency before its needs are satisfied, and it is the earnest desire of the Home Country that this deficiency should be made good, as far as practicable, from within the Empire, instead of from foreign countries. The statistics quoted by the Committee indicate that this desirable object is, as yet, far from being realized. As an indication of its earnestness, the Government has set aside an annual sum of £1,000,000 a year in the hope, to quote Mr. Baldwin, that "it may be possible to open up entirely new and untried ways of developing trade within the Empire." The task is at once complex, difficult and delicate, and is, moreover, one which cannot, and ought not, to be unduly hurried.

Whatever size economic unit we take into consideration it is evident that buyers frequently give their customs to those who, in turn, buy from them. This preference is already observable within the British Empire and there appears every reason why this sentiment should be encouraged, since in buying Empire foodstuffs British people are at one and the same time helping their own best friends and giving their custom to their own best clients. There is abundant evidence, *ceteris paribus*, that the consumer would undoubtedly select Empire produce provided he could recognise it. This preference on the part of the consumer, would not, and should not, as a rule, operate when the goods are more expensive or inferior in quality. Hence it is to the obvious interest of the producer to cater for the consumer both in regard to price and quality. The point with which we are mainly concerned at the moment is that the consumer should be placed in a position to exercise in an effective manner a discrimination in favour of Empire products. To do this he must know the origin of the goods which are placed on sale, and this involves the marking, in some way, of the goods offered to the public. In certain countries, both within and without the Empire, producers of high quality goods desire a mark of origin in

order to avail themselves of the good-will which attaches to the name of their country. It is desirable that such descriptions of origin, when attached by producers, should be protected by law in order to prevent their being falsified, concealed, or removed, more particularly in view of the evidence that, notwithstanding the fact that the repute of certain brands of goods was originally built up on the excellence of certain Empire products, the brand label is now also utilized to cover foreign goods. Protection is already afforded by the Merchandise Marks Act of 1887 but while the provisions of this Act are satisfactory as far as they go, they do not go far enough.

But the broad distinction between Empire goods and foreign goods is another matter since it seeks to mark a distinction in order that the consumer may exercise his discrimination on grounds other than, or additional to, those of quality and price. For this purpose a mere statement as to the country of origin is insufficient since the average British housewife is lamentably ignorant of the many and vast territories included within the British Empire, and she cannot reasonably be expected to carry a political atlas with her on a shopping expedition. The appeal must, therefore, be direct, and the Committee proposes that goods exposed for sale should be marked with the words, "Home Produce," "Empire Produce," or "Foreign Produce," according to their origin. Countries in the second and third categories, whether within or without the Empire, should be entitled to add the name of their country in addition to the general statement, where such an indication is likely to make a special appeal to the public.

Empire producers must, however, realize that such a means of identification is accompanied by responsibilities as well as privileges. There is no more certain way of driving an inferior product from the market than by indicating its origin in such a manner that the consumer will recognize it whenever it is offered for sale. The Empire can produce goods as excellent in quality, as efficiently prepared, and as attractively presented, as the goods produced in any other part of the world, but there is still vast room for improvement. Governments throughout the Empire should continue to encourage the better grading, packing and presentation of goods in order that the full advantage may be secured by identification. In other words such an identification must be a hall mark of quality and not a stigma of reproach. But excellence of quality alone will not suffice. There must be, in addition, regularity and continuity of supply, since publicity undertaken in respect of foodstuffs which are irregular in supply and insufficient in quantity will inevitably cause disappointment and dissatisfaction. For this purpose supplies of the various commodities should be correlated so as to prolong the number of months during which Empire produce of any kind may be on offer in the shops. The sympathies of producers, distributers, and consumers must be enlisted and for this purpose the Committee proposes to devote rather more than half the annual grant towards inaugurating such a national movement. Sporadic but successful efforts, such as "Empire Shopping Weeks" and so forth, indicate the response which a continuous national effort would meet. Substantial sums must be expended in research, both in the United Kingdom and in other parts of the Empire. When we realize the vast potentialities of the Empire, both as producer and consumer, the importance of such proposals needs no emphasis. Sympathy in the United Kingdom is already assured and it now rests with the Empire producers to provide that adequate and continuous supply of high quality goods which will enable the consumer to exercise a preference in favour of "Empire Produce." It is to be hoped that the scheme with its vast possibilities for good or evil, will not be regarded merely as a matter of Imperial but also as of Inter-Imperial concern.

BRITISH GUIANA.

The delayed report of the Immigration Agent General for British Guiana during 1923 contains interesting statistics regarding the welfare of East Indian immigrants in the "Magnificent Province." During the year no further immigrants arrived from India. But negotiations (following exhaustive investigations within the Colony) are being carried on with a view to securing a resumption of immigration. During the year 211 "souls" of whom 69 were paupers were returned to India. These return immigrants left the Colony with £3,812 10s. 0d. in money, and jewellery to the value of £635 8s. 4d. in their possession.

The East Indians remaining on December 31st, 1923, totalled 124,453. Deaths during the year numbered 3,924, and births 3,880, showing an excess of deaths over births 44. This excess of deaths over births is often attributed to bad climatic conditions and used as an argument against immigration. In fact it is due, in the main, to the unequal sex composition of the population, there being 68,109 males and 56,344 females among the East Indian population, from which it naturally follows that the birth rate must be smaller than in a similar population where the two sexes are equal in number, or where the number of females exceeds the males. In cases where males preponderate, the birth rate, for reasons which we need not explain here, becomes progressively smaller as the population of females decreases.

During the year the births of males exceeded those of the females by 129, but on the other hand the deaths among males were greater by 723 than those among females, so that during this period the preponderance of males was reduced by 594. Every encouragement is given for East Indians to emigrate in couples from the West Indian Islands. It is to be hoped that if and when immigration from India is resumed, every effort will be made to prevent the introduction of a large surplus of male labourers.

EFFICIENT AGRICULTURE.

Professor J. Sydney Dash, b.s.a.

In an essay appearing in *Science Progress* for July, 1925, entitled "One Hundred Years of Agricultural Science," the author G. E. Fussell states "the benefits scientific knowledge has conferred upon agriculture are not to be depreciated, but for the last two centuries they have been so enthusiastically stated that there is now little doubt of the exaggerations of the protagonists." He, however, believes that the farmer or agriculturist has not made the most complete use of the knowledge and learning investigators have placed at his disposal. Many competent observers are of the opinion that the amount of scientific investigation already carried out has not yielded results compatible with the effort made. In this connection, stress is usually laid on the operation of the law of diminishing returns or, more correctly speaking, disproportionate returns—that, irrespective of scientific advances in agriculture, this law will always operate at some point to render nugatory the application of additional expenditure of capital and labour towards increased output. Indeed, this point may have already been reached in the more settled areas of the globe where the pressing problems are not so much capable of immediate solution by research in pure science as by a change in the economic system. This is no argument against the need for research as applied to agricultural problems, the urgency of which is constantly forcing itself on us from every angle, but research cannot be hurried, since "the organisms (plants and animals) we are dealing with will go through their cycle and you cannot hurry them . . . . . cows bring forth their calves neither more quickly nor more numerously for us than they did for Abraham." In the meantime, there is much to be done in other directions where we are still following the beaten track.

Admittedly, our educational policies in respect to agriculture, have not, in the main, kept pace with post-war necessities. While the man on the land no longer needs what might be called first aid—he is growing more and more competent of doing that himself—his present troubles are harder to treat and the question of costs is the most serious. In addition, there is much fallacious teaching to be undone and the problems still to be solved multiply hourly, clearly demonstrating in the end a need for yet more highly trained men. On the other hand, a great deal of criticism has been levelled at the methods of dissemination of agricultural knowledge; it is claimed by some that although further information is required, there is already an appalling mass in undigested form, and this accounts for the wide divergence between knowledge and practice which is seen to-day. There is another criticism often encountered, namely, the danger of over-specialisation in the study of crop production problems—a specialisation which breaks up subjects into so many fragments that the relationship between them is either ignored or forgotten, thus detracting from the practical value of such studies; the plant itself recognising no difference in terms of science between the many factors that influence its growth. While this is in a measure true, no individual investigator would be found humanly capable of the burden imposed upon him by the increasing complexity of present day problems, and the difficulty of having a group of workers seeing eye to eye and functioning as one *vis-à-vis* the plant is practically insuperable. For these reasons, research must proceed unfettered; at the same time where close co-operation is attainable, the most useful results may be expected.

II

But it is with the present economic system and the question of agricultural costs that we are particularly concerned in the theme under discussion, for it is in this direction that we must break fresh ground if, in the tropics, we are to avoid the economic ills with which temperate agriculture at the moment seems encumbered. We believe, from the point of view of the man on the land, that only by adjusting our agriculture to the new outlook can we hope to draw the maximum profit from scientific research. We must seek by every possible means to render ineffective the law of diminishing returns by efficiency at all stages, not only in methods but in management. In other words, agriculture in the tropics must adopt the policies of the big business enterprise. In the case of permanent crops, notably rubber and tea, much has already been accomplished, unfortunately by procedure which has led, unwittingly perhaps to the establishment of monopolies. Arable or field crop agriculture, on the contrary, has been distinctly backward in organising for efficiency on the *purely agricultural* side, and the first question to be determined is the most economic size of the unit of land to be worked. We quote Sir Daniel Hall, who suggests 2,000 to 10,000 acres under temperate conditions, and who sums up the case against the small unit admirably in an article entitled "Feeding the World" which appears in the May issue of the *Atlantic Monthly* as follows:—"For obvious reasons the small farm is less efficient, less economic of human labour than the large one. It is handicapped physically in that the size of its fields does not permit of the effective use of machinery or orderly disposition of labour. Overhead charges are high; the capitilisation of the small farm is excessive. Economically, the small farm is a weak unit in buying and selling, and though this handicap has been largely removed by co-operation in countries like Denmark, the handicap still exists. Intellectually the small farming community tends to become hidebound and unprogressive; it is more difficult to carry enlightment to it or get new developments of science put into its practice." An obvious handicap, so far as the tropics are concerned, is the question of peasant population; undoubtedly, there is something to be said in favour of peasant

holdings where no other system seems possible and where this type of population is the only one on the land, but it cannot be denied that without some form of organised control these communities tend to retrogress rather than progress, ekeing out under such conditions a mere existence. It is significant that those West Indian Islands where the small cultivator predominates are the worst off economically. It may of course be argued with some truth, that the inherent geographical nature of those Colonies makes their problems, from this point of view, well-nigh impossible of solution.

III

A few examples from the sugar producing world will serve as useful illustrations, since sugar is probably the most important field crop in the tropics.

In the first place, the methods of the Hawaiian industry may be instanced. Expenditure is on a generous scale in every department, both in field and factory, the two proceeding along well-balanced lines. Besides, as is well known, a considerable sum is spent directly on research, and the whole industry appears to be so effectually organised that it is in a position to apply the results at every stage in production, thereby obtaining a maximum profit from the outlay. Recent reports indicate great prosperity in spite of the comparatively low levels touched by the raw product during the past year. Thus, the point at which the law of diminishing returns operates has been pushed steadily forward. There are indications of a similar prosperity in Java where efficiency in both field and factory has laid the foundations of permanency in the industry.

Turning to the West Indies we find a different picture. F. S. Earle writes "Sugar-cane agriculture in the West Indies is 50 years behind the manufacturing side of the industry." We do not believe this can be disputed. The natural advantages possessed by Cuba, coupled with the preferential treatment in the markets of the United States, have made her the greatest sugar producing country in the world, but although she heads the list in output, her agriculture is probably the most backward. Those engaged in the industry have set out if possible to defeat the law of diminishing returns by a process which seems destined, if adequate measures are not taken to apply drastic remedies, to have a far-reaching effect on the future outlook. With factories organised on a large and highly efficient scale in most cases, the object has been all along to secure a cheap supply of cane by the most inefficient agricultural methods—a policy which may prove more costly in the long run. There is scarcely any large scale field organisation, but a system of agriculture usually referred to as "colono" which has steadily gone from bad to worse. Current sugar journals tell us of constantly decreasing yields on the old lands to such a point, that, in numerous instances, cane production has ceased to be remunerative at present prices. We read in *Facts About Sugar* that unless a practical programme for checking declining cane yields is adopted on virgin land estates, any substantial asset provided by these lands will rapidly disappear. It is also stated in the *Cuba Review*, that many hitherto interested in sugar, in the Republic, especially planters and mill owners of small capacity, are turning to Henequen and Sisal production. This industry appears to have received a marked stimulus as a result of the unsettled conditions which have prevailed in Yucatan during late years. Here again experience has shown that large scale measures will be necessary to produce a crop profitably. Cuba's hope, therefore, lies in the direction of larger and better field organisation without delay, so that she may be ready to apply the results accruing from the researches inaugurated by the Tropical Research Foundation, recently established in the United States for the study of tropical agricultural problems. In other words, she must tear a leaf from Hawaii's book if the industry is to continue to flourish on sound lines. Intensive field methods need not imply increase in total output; on the other hand, much land now yielding little or nothing could be released for other purposes, *e.g.*, fibre growing, &c. (In Hawaii, the pineapple industry is a formidable supporter of sugar, but this too, has grown and prospered from carefully planned and organised large scale enterprise.) The tendency in Porto Rico also is toward a well-balanced field and factory policy.

In the sugar-growing islands of the Lesser Antilles, there has, it is true, been considerable progress made in factory organisation and equipment, but small and inefficient factories still exist. Where co-operation is practised, the same principle might reasonably be extended to the land. In St. Kitts, for instance, a movement looking to co-operative association with the pooling of resources in respect to the purely agricultural activities of the industry might conceivably grow in time from the fact that one factory now takes off the sugar crop of the entire Colony. Such a policy, although implying a change of system, need not necessarily imply a complete change in mode of life to the proprietor of the small estate, the independence and privileges of which he has been willing in the past to pay for out of all proportion to immediate pecuniary return. There has been such a change in the whole economic outlook in the matter of agricultural costs everywhere, that even such seeming independence can be purchased too dearly and the existence of the small estate in the tropics, like the small farm of temperate regions, is rapidly becoming more and more precarious.

There is no need, it is felt, to stress the application of the principle to other staples. It does not hold, naturally, in reference to commodities—the products of communities favoured by circumstances such as climate, proximity to markets, &c., or for which there is a special demand. In this category, examples that occur at the moment are to be found in the expanding vegetable growing industries of the Bermudas and Bahamas, where proximity to

the United States and tourist hotel requirements in the islands themselves create conditions similar to truck gardening outside large northern cities. Or again, in the sub-tropics, we have the banana industry of the Canary Islands and that now developing in Florida, although in the former, progress again points toward the larger unit. Under these conditions, the smallness of the unit is offset by the extreme intensiveness of the enterprise, increasing the land value (good banana land in the Canaries is worth from £1,500 to £3,000 per acre) and not infrequently requiring the application of large scale principles.

IV

The advantages of this new orientation we think are too obvious to necessitate enumeration, being the antithesis of the disadvantages of the small unit, stated at some length earlier in this article. The management of the larger unit can put into practice such aids to efficiency as a system of cost accounting, which is unachievable on the small estate. From it can be studied expenditure at every stage in relation to losses and gains, thus providing precious assistance in the choice of alternatives which the small man has not learned to consider. The better disposition of capital, machinery, labour (usually the highest item in cost of production) and other considerations tending towards reduction of costs are possible with the large unit. Besides, all matters relating to improvements can be studied and executed on broad and profitable lines. The whole aspect can be summed up in the term scientific management as opposed to amateur guesswork.

Generally speaking, so far as the tropics are concerned, two difficulties may appear to stand in the way of rapid developments of the kind depicted, namely, the piecing together of the smaller units already in existence and the providing of trained administrators. Of the two, the latter we conceive to be the more serious, for although natural capacity is a strong asset, new ideas must be inculcated and in short, such administrators must be thoroughly trained and qualified. This will take time, nevertheless, we believe, it opens up a fine field for men of energy and intelligence who have reached a sufficiently high standard of ordinary education to profit by further intensive study of university standard. It is not a question of simply providing a few leaders, but a large number of trained subordinates as well, each capable of sharing responsibility.

With this outlook in view, an important step has been taken by the Governing Body of the Imperial College of Tropical Agriculture in their determination to add a large estate to the equipment of the College, where it is hoped some of the ideas herein expressed may be elucidated and future estate administrators and others given a substantial training. It is a recognition too of the importance of the agronomic and economic branches of agricultural science, which provide as large and varied a field for research as do the chemical, physical and biological branches. Indeed, the former may be regarded as the key to successful agricultural enterprise.

AGRICULTURAL NOTES.

Compiled by the College Department of Agriculture.

Milk Production.

Economic milk production has made rapid strides in England during recent years. The keeping of milk records is the principal contributing factor, as it makes for better judgment and accuracy in respect to feeding and management. In this connection, *The Field* recently notes the developments in Wiltshire, which have attracted the attention of other counties. For this improvement, much credit is due to the Agricultural Officer of the county, who has carried out an active and intelligent educational campaign.

Modern practice provides for a division of the cow's ration into two parts—the maintenance ration, sufficient to maintain bodily condition and health, and the production ration, consisting of materials similar to those found in milk and be fed strictly in accordance with the individual yield of milk. Herein lies the value of careful and systematic milk recording of each animal; it enables also the poor and uneconomical producers to be weeded out. A cow's daily yield being known, it is a simple matter to feed her correctly and it is recommended that about 3½ lb. of concentrates be given for every gallon of milk produced.

A practice which is being condemned is that of feeding hay and straw before concentrates, it being urged that if the cow is fed first with bulky foods which are liberally eaten, her stomach becomes overloaded with the palatable meals and digestive troubles may ensue. A plentiful supply of clean water for drinking purposes is essential, and where not accessible to the animals at all times, dairy cows should be watered at least three times daily, including one watering last thing at night. It may be noted that a good milk cow will drink about 100 lb. (10 gallons) of water in a day. This is not excessive, considering that milk contains 87 per cent. by weight of water. A good plan is to feed in the morning half the concentrates, followed by half the fodder, then water; in the afternoon, the remaining concentrates, then fodder and water again. Under English conditions, it seems that the young grass of early summer may provide nutriment sufficient for maintenance and for the production of the first three gallons of milk in most cases. As the season advances, grass feed loses some of its value and it is advisable to give concentrates for every gallon after the first two, gradually increasing the production ration with the arrival of winter. Under tropical conditions, this schedule may need some adjustment, but the underlying principle should be adhered to. In addition, the housing of cows during the heat of the day for three or four hours, when the concentrates might be fed, is recommended.

In the old country again, much progress has been made in the matter of graded milk—a post-war development. The annual production

of such milk in three classes—Certified, Grade A. (Tuberculin Tested) and Grade A.—now totals five million gallons. The first class is, of course, a luxury, but in spite of being a little more expensive to produce—the extra cost at present being barely met by increased price—prominent dairymen are convinced of the advantages to them of turning out Grade A. (T.T.), the second class. Foremost of these perhaps is the resulting improved constitution of the herd, bringing about also increased prices for stock sold; then too, the extra cleanliness needed in the cowshed tends to eliminate such troubles as contagious abortion and other dangers. Further, as this class of milk will keep sweet longer than ordinary milk, it must in the end tend to a greater consumption of whole milk, which will eventually benefit both producer and consumer alike—the former's pocket directly, the latter's health and indirectly his pocket as well.

In the tropics, where milk production has always been more or less a haphazard business, many of the points put forward above deserve more than passing attention at the present time.

Field Rat control in Hawaii.

The rat problem in Hawaiian cane-fields has been receiving intensive study since 1922, according to Bulletin 17 (Entomological Series) of the Hawaiian Sugar Planters' Association Experiment Station. Three species are recognised: the black or house rat, *Rattus rattus*, Linn., the Alexandrine rat, known also as the tree or roof rat, *Rattus rattus alexandrinus*, Geoffroy, and the brown rat, *Rattus norvegicus*, Erxlelen, known also as the wharf or migratory rat. A native species, *Rattus hawaiiensis*, Stone, is now very rare. The three cosmopolitan species above-mentioned are all destructive to cane, particularly the brown rat. As is well known, rats are exceedingly prolific and young may be found at all times of the year in Hawaii. The period of gestation is from three to four weeks, sexual maturity occurs at three to four months and a normal litter ranges from six to ten young, while the number of litters is from five to six per annum. These figures give an idea of the rapidity with which numbers may increase if no control measures are taken. Investigations show that plenty of cover with grass and weeds is an important factor in rat abundance; rainfall does not appear to influence it to any extent.

Much data have been secured relating to losses from rat damage in the cane-fields of the Territory. Calculations in 1920 showed that it took nearly twice as many tons of rat injured cane to produce a ton of sugar as sound cane, owing to juice deterioration, and in the case of one large sugar company—before poison control was adopted—from 25 to 40 per cent. of the canes were said to have been rat damaged. Other figures indicate losses amounting to 19·17 per cent. in the case of a company harvesting 13,522 tons of sugar in 1922, or 2,592 tons of sugar. Further studies in this direction tend to confirm the magnitude of the damage; in 1923, the loss on five fields in one case was at the rate of $51.88 per acre with sugar at seven cents per pound. Rat injury is familiar to all sugar growers: young cane, that is cane less than six months old is not usually attacked, while the older, ripe stalks are often chewed in their entirety, greatest attention being paid to soft sweet varieties.

After reviewing the methods in vogue for rat destruction, *e.g.*, use of traps, poisons, dogs, virus, natural enemies, &c., the results from intensive poison application in Hawaii under cane-field conditions are given, which clearly indicate the value of such repressive measures compared with slower, less effective methods. Losses noted previously by one company have been reduced to 4·29 per cent. and monetary savings of $75,000 to $100,000 annually have been made at a cost of about $5,000. These results, it is claimed, argue well for continuance of the campaign. Baits with barium carbonate or strychnine as a base have proved most efficient, and particularly the following formula:—"Barium carbonate (by weight) 1 part; flour, or preferably middlings, 3 parts. Mix the two together, add enough water to knead into a stiff dough, roll into sheets about ¼ inch thick, cut out small cakes about ½ inch in diameter and dry thoroughly in an oven or by the sun." It is then ready for use, a small portion of one cake being as a rule fatal to a rat. A method of rain-proofing these cakes has also been devised, namely, by dipping each cake after being dried and hardened into melted paraffin so that it becomes covered with a thin, protective film. Kept dry, these cakes do not deteriorate and have been found, after two years' storage, to be as effective as fresh cakes. Any moulding whatever ruins the bait, as it then becomes unpalatable to rats and mice. One cake to every 100 square feet at each treatment is recommended to start with. On one plantation in 1922, 2,333 acres were treated three times at a total cost of $1,125, equivalent to 7,000 acres treated once. Home-made baits on such simple lines offer no difficulties in handling and are much cheaper and more efficient than commercial preparations.

Our attractive contemporary, the *Empire Mail*, contains in its July issue an interesting article entitled, "Trinidad's Increasing Importance." Special prominence is given to the College as a centre of agricultural training for the tropics. The decision of the Empire Cotton Growing Corporation to establish a central research station in the island is regarded as the second important development within the island in recent years. Major Randolph Rust, Honorary Commissioner for the Colony at the British Empire Exhibition, describes the romantic rise of the oil industry. The island is aptly described as one of varied resources and beauties which appeal equally to the business man and the tourist.

ENEMIES OF BOOKS.

By Sir Arthur E. Shipley, G.B.E., F.R.S.,
Chairman of the Governing Body of the College.

Books are apt to get in a bad way in the tropics. The vivid sunlight bleaches their colours, and their bindings fade until they appear but ghosts of their former selves. In England one has usually noticed that books bound in red retain their brightness rather better than books bound in any other colour. But I do not know whether that is the case in the tropics. In the damp heat of the hotter regions of the world books also suffer greatly from moulds and mildews. But this can be easily checked if the books are kept in bookcases with glass doors, with an electric bulb left alight inside, just as an electric light is kept inside a piano in those regions.

But the most serious injury to books in the Tropics is due to insects. There are the most lovely little creatures, covered with silver-grey scales, known as *Lepismas*, common enough at home in sugar barrels and in bakehouses. They are usually termed "silver-fish," though the bakers in some parts of England call them "fire-brats." They live for the most part on farinaceous food, and what they seek when they attack books is the paste which has been used in the binding. This they consume and thus destroy the book. *Lepismas* have no wings, but they run about very actively on their legs. But the absence of wings means that one can protect the bookcase and its contents from their attacks more easily than if they could fly about. They are animals of some geological age, and have been frequently found in amber and also in certain tertiary deposits. *Lepisma* is on the whole nocturnal in its habits and like many wingless insects is difficult to catch, for its movements are rapid and erratic. It seems almost impossible to keep it alive in captivity. The eggs are laid in Central Europe in May, chiefly in flowers, and never upon paper or cloth. In India 6-10 eggs are laid which hatch out in 45-60 days. The young become adult in about 2 years. The larvae appear about the beginning of July and they hibernate from the beginning of November to the end of March. They are recorded in Germany as being extremely destructive to books, papers and pictures. They are strictly vegetarians, preferring a farinaceous diet. The genus seems to be a very cosmopolitan one, and is recorded from Ontario as destroying wallpapers, bindings of books, and starchy foods. In that Province it is said to be successfully kept under by the use of sodium fluoride or pyrethrum. Cardboard covered by a starchy paste in which white arsenic or mercuric chloride has been mixed is an effective bait. In a confined space they are killed by the vapour of camphor, and naphthalene and also by that of crushed eucalyptus leaves, oil gas and tobacco smoke.

Another primitive insect which is very destructive to books is the Cockroach. Certain species of cockroaches are essentially the companions of man. They are found wherever human beings have an habitation and they are very common on ships, where they are known to nibble the toes of the passengers. Like the silver-fish, they are very active and difficult to catch. They will devour nearly everything, all sorts of human food are eaten and fouled by them, but they will also eat woollen clothes, blacking, ink, and leather, *i.e.*, boots, especially the calf leather uppers, and even emery-paper. They destroy the covers of books in Australia or elsewhere. The Librarians in the big Libraries in Sydney prefer Sheep-skin as bindings and then Pegamoid (an artificial leather). These also resist the destructive effects of a hot climate better than does Morocco or Russian. Cockroaches are extremely difficult to control. One of the best methods perhaps of poisoning them is plaster of Paris, which, solidifying in their alimentary canal puts their digestion out of action. Keating's powder is also used; but, as Mr. Butler tells us:—

"Spite of 'beetle-traps' and 'vermin powders,' it maintains its ground; neither rats, cats, nor hedgehogs (all numbered amongst its foes, and the last a specially greedy devourer of it) are able materially to lessen its numbers. By reason of some subtle superiority, perhaps impossible for our gross senses to perceive, it continues to be victorious over all its enemies, and in the face of all opposition and efforts to exterminate it, still flourishes and continually spreads. It is, indeed, gradually dislodging an old and familiar inhabitant of kitchens, the house-cricket, an insect of very similar habits to itself, and no very distant relation of its own."

I managed to get rid of the cockroach in the servants' quarters of my Lodge by pulling them down, but that is a drastic remedy, which is not possible in every case and was only possible in mine, because they were condemned by the local medical and sanitary authorities as unfit for habitation.

Another insect which is very dangerous is the so-called bookworm. This is the larva of a beetle belonging to the family *Anobiidae*,* which are destructive to dried animal matter, and many of them attack specimens in museums. An allied form *Anobium paniceum* is very catholic in its taste. Many consecutive generations have been known to live on a diet of opium. It is common enough in ships' biscuits, which the sailors call weevilly. These beetles fly and are hence more difficult to control than silver-fish. Another allied form has done infinite damage in destroying the roof of the Great Hall of Westminster and the oaken beams of many a church in England.

Books infested by *A. paniceum* which is a cosmopolitan beetle of the family *Anobiidae* are fumigated with carbon bisulphide with success. This particular pest has caused much harm in Barbados. The little wood-boring beetles (*Anobium pertinax* and *A. striatum*) also attack books, and will even bore through several volumes.

* I have followed Imms and others in including the family *Ptinidae* in the family *Anobiidae*.

M. Peignot mentions an instance where in a public library but little frequented, twenty-seven folio volumes were perforated in a straight line by the same grub (probably one of these species), in such a manner that on passing a cord through the perfectly round hole made by it, these twenty-seven volumes could be raised at once. The animals last mentioned also destroy prints and drawings, whether framed, or preserved in a portfolio. In British Guiana another anobiid, *Lasioderma serricorne*, attacks stored grain, tobacco, biscuits, paper, leather and books.

In Brazil, Dr. Faria states in an article on the Enemies of Books :—

" The only Coleoptera are two Anobiids, *Catorama herbarium* and *Dorcatoma bibliophagum brasiliense*. The damage they do is very extensive, *Lepisma* and other book pests being of little importance. *D. bibliophagum* appears to be exclusively a book pest, while *C. herbarium* attacks furniture and other woods as well. They are crepuscular or nocturnal in habit and in hot summer evenings have been seen at nightfall to issue from books and go to the windows. The eggs are laid on the binding or on the edges of the leaves. The larvae hatch in 5-6 days and burrow in search of pasted portions; when their mandibles become stronger they begin to feed on the binding and continue to do so until the pupal stage. They then return to the external surface, which in the case of books on the library shelves is the backs. Here they increase the size of the mine and cover it with a roof of excreta and paper. The adult emerges through a hole in the thin wall of the chamber and the perforations seen on the backs of books are these exit-holes. These may subsequently be used for oviposition, though the primary infestation is due to larvae that have hatched on the surface of the books into which they burrow through minute holes. As a general rule the development of these beetles in S. Paulo takes place from October to December. Different stages occur at the same time. Eggs have not been found, nor was the act of oviposition observed."

" To be effective against these beetles an insecticide must destroy all stages from egg to adult, and sulphurous anhydride is recommended for this purpose. The pressure necessary for all parts of the books to be disinfected is attained when the fumigation chamber contains 12 per cent. of the gas as measured by a densitometer placed in the uppermost zone. Fumigation must be continued for 30 minutes at 12 per cent. strength, and a longer period is unnecessary."*

Mr. J. R. Bovell has drawn attention to the fact that *Zygops histrio* is found amongst books and in Fiji *A. paniceum*. Bindings have been completely destroyed by their larvae and many official records would be rendered valueless if left untreated. Book-cases were fumigated twice with hydrocyanic gas, and enormous numbers of dead larvae and pupae were found.

Aglossa pinguinalis, a member of the family *Pyralidae* moth, establishes itself upon the bindings of books, and it makes a silken nest which it covers with its excrement, and according to Kirby and Spence, does no little injury. The larvae of this species amongst other things will, as its name indicates, feed upon butter and lard, and in order to prevent its spiracles being closed, each segment is, according to Reaumur, divided into two parts, and underneath has two deep folds, by means of which these two parts can separate to a certain point, or approach again, according to circumstances. Thus, Providence has enabled them to prevent their spiracles from being stopped by the greasy substances on which they often feed. The larvae of this particular moth, which is common in houses, is found, according to Linnaeus, in the stomach of human beings. It is occasionally voided straight from the alimentary canal, but there is one case on record in which one of the larvae escaped from the nostrils of a young man who had long suffered from severe pains in the head. Kirby and Spence also record the caterpillar of another little moth, whose species was not ascertained, that takes up its station in damp old books, between the leaves, and there commit great ravages; and many a black-letter rarity, which in these days of Bibliomania would have been valued at its weight in gold, has been snatched by these destroyers from the hands of book-collectors.

There is a little insect belonging to the Psocoptera known as *Troctes divinatorius* which is often termed the book-louse. It has lost its wings and its eyes are vestigial. It does considerable damage to zoological collections in the south of Russia. It is kept under control by putting in the cases a little of a mixture of 4 lb. of naphthalene and 4 ozs. of camphor melted over a slow fire. Care has, of course, to be taken to prevent the naphthalene igniting. When melted this mixture is poured into a little mould in the form of a potato pierced by a small cylinder. When cool the bars can easily be pressed out of the potato. The same book-louse causes much damage to wheat in Montana. The reputed power of producing a ticking noise has earned for this insect the name of ' death-watch ' which it shares with *Xestobium rufovillosum* de G. (*tesselatum* Oliv.) but as Imms says " It is difficult, however, to understand how so small and soft-bodied an animal can produce a sound audible to man."

The small Pseudo-scorpion, *Chelifer cancroides*, is also found amongst books. Like other members of the genus, it is frequently dispersed by clinging on to the legs of flies or other flying insects. It is a natural enemy of *T. divinatorius*. Books have been cleared of this pest by enclosing them in an iron box in which a saucer is placed containing 2 ozs. of carbon bisulphide. This is sufficient for a space of 60 cubic feet, and in twenty-four hours, eggs, larvae, and insects are killed. Care has to be taken when the box is opened. *Chelifer cancroides* which generally lives in old books, herbariums, and zoological collections, is also found in beehives.

(*To be continued.*)

* "Os Mimigos dos Nossos Livros." D. de Faria. Copied from the abstract given in Rev. App. Entom. Ser. A. Vol. III, p. 36 of the original article in the Serviço Sanit. do Estado de São Paulo. N. S. No. 4, 1919.

COTTON RESEARCH STATION.

To those who have not had time and occasion to study the full Report by Professor Farmer and Mr. Kilby on Trinidad as a site for the Central Research Station of the Empire Cotton Growing Corporation, the summary which has recently been issued will be of interest. Attached to the summary are two communications. An introduction explains what are, and what are not, the objects it is hoped the station will achieve, and a foreword, by Dr. Balls, records the history of the movement. Each in its different aspect is so important that they are here produced *in extenso*. In historical sequence from the latter the station is seen to owe its existence to the vision and energy of the late Mr. Mc Connel who, till his death, did so much to broaden the basis on which Lancashire's prosperity depended. Again the desirability of a clear appreciation of the functions and limitations of the work of the station is unquestionable and this the former supplies.

INTRODUCTION.

In view of the decision of the Corporation to adopt the recommendations contained in the following Report and to establish a Central Cotton Research Station in Trinidad, it may not be amiss to state clearly, though in general terms, what is, in the view of the Corporation, the scope of the work of that Station, so that there may be no misconception as to the functions which it is believed it can and cannot discharge.

In the first place, emphasis should be laid on the distinction between those problems, on the one hand, the solution of which will lead to an extension of our general knowledge of cotton and of the ultimate conditions which govern the development of the plant and the properties of its lint, and on the other hand, those which are primarily local in their origin and can only be fully solved under the conditions of the locality in which they arise.

A general description in one sentence of the work to be undertaken would be, that it is intended to investigate there the cotton plant in all phases of its growth and under rigorously controlled conditions, so that it may be possible to ascertain and to estimate the importance of the several factors which contribute to the final result. On the other hand, what it is not intended to do is to provide strains of pure line seed for large-scale distribution to the cotton fields in different parts of the Empire. The effect of the acclimatisation factor on the properties of any particular type of cotton renders it essential that the production of seed for this purpose must be carried out in the several countries themselves, and the utmost that a Central Station can do in this direction, wherever it may be situated, is to breed out pure lines for special characteristics. These in their turn will have to be *locally* tested in different parts of the world in order to find out whether they are satisfactory in any particular country, and so to serve *in that country* as a starting-point from which it can raise its own seed.

Among the investigations which it is intended to conduct at the Station may be mentioned, merely as examples, a study of the mechanism of the growth and behaviour of the cotton plant, its reaction to its environment and of the connection between the characteristics of the lint and its spinning qualities. As explained in the Report, the fact that cotton *can* be grown in a limited area within Trinidad, but is not grown on a commercial scale, renders the Island in very important respects the more suitable for the purpose of a Research Station.

While it is hoped that the Station will so justify itself by its work that it will be adopted by cotton workers in the several parts of the Empire as a central clearing-house at which local problems can be further investigated under standardized conditions, its establishment will in no way relieve Departments of Agriculture of the necessity of continuing the scientific side of their research work on cotton. Local problems can mostly best be solved locally, but the experience which the Central Station should accumulate should enable it to suggest where and how any particular problem should be attacked with the greatest prospect of success, and thus enable it to be of assistance to all cotton research workers. Furthermore it is hoped that it will provide a scientific link between growers and manufacturers. It is in this latter capacity that the Corporation regard it as essentially important that close touch should be maintained between their Research Station and the British Cotton Industry Research Association, and free interchange of information should be maintained between the two bodies.

While this Introduction will have served a useful purpose if it prevents misunderstanding as to the objects which the Corporation believe can be secured through the work of the Station, a further word of warning may not be out of place. Botanical research, owing to the nature of its material—the growing plant—is not a rapid process, and, for the same reason, cannot be expedited. It is only by a steady and systematic study of the several factors that have to be taken into account that such additions can legitimately be expected to our knowledge of the cotton plant as should lead to results of benefit to both growers and spinners alike.

FOREWORD.

By Dr. W. L. Balls, F.R.S.

In May last the Executive Committee of the Corporation adopted a proposal to establish a Cotton Experiment Station for the British Empire.

The changes brought by the last eight years make it difficult to realize what a visionary I felt myself to be when I began to dream, in 1911, of a Cotton Experiment Station which should serve the cotton fields of the British Empire in somewhat the same way as Rothamsted serves all agriculture in temperate climates. I was then working at Giza, and the steady accumulation of records year by year, together with the endless rush of new

problems, made itself-evident that some permanent and far-reaching scheme of this kind was awaiting its genesis. Moreover, Giza was then the site for it: six days from London, a dependable climate, a decent soil, the best of all labour, a metropolis within cycling distance, and no difficulty in getting or keeping good staff.

But my dream was merely Utopian. There was the practical difficulty that many of the lines of research with which Giza bristled were of no cash value to Egypt; they might increase the general knowledge of cotton, but without bringing exclusive, or even prior, advantages to Egypt itself; and, after all, an Agricultural Service is a business proposition of a sort. So the money, for what in my own mind I called a Cotton Rothamsted, would have to come from outside—which was nowhere. The agricultural services in most parts of the Empire at that time were notorious Cinderellas, and by no stretch of the imagination could they be in a position to finance an ideal difficult of attainment and possibly, in their view, of doubtful value. The cotton industry was even less likely to do so; it certainly had the beginnings of a contract with cotton growing through the International Federation of Master Cotton Spinners' Associations, but, as a whole, its interest in raw cotton did not reach beyond the broker; to say that growing and spinning were equal and inter-dependent parts of one industry was regarded as merely an ingenious paradox.

If the spinner were unlikely to offer help, still less likely was Egypt to have accepted such help had it been offered. The spinner was the bogyman who would not pay fair prices; Government departments were scared at any attempt at intercourse with him; and a fantastic atmosphere of suspicion and muddle surrounded the pre-war study of cotton, in Egypt at all events, whenever one foot was advanced across the parochial boundary.

Then came the war; and however much less the peace may be than our hopes, the two together have given us a cotton industry which is more self-conscious, more homogeneous, and better organized for the acquisition, dissemination, and application of new technical knowledge than was even imaginable in 1911. The "overseas man" on leave can get into touch through the Empire Cotton Growing Corporation and the British Cotton Industry Research Association in a single day with more people and more suitable people than in a whole summer's leave ten years ago.

And one result is that Utopia has been achieved, though not in Egypt, but in Trinidad.

My purpose in the remainder of this note is to show how it is to the imagination and knowledge of Mr. J. W. McConnel, whose death in 1922 was such a loss to the industry, that we owe this achievement. And the transition is a remarkable step, for the foundation of this station is an act of faith; of faith in the immensity of our ignorance about cotton; of faith that knowledge is future power, acting in directions quite impossible for present ignorance to predict.

I summarized some of my schemes in 1914;* and the formation of the British Cotton Industry Research Association and the Empire Cotton Growing Corporation, which both began under Mr. McConnel's chairmanship, gave him the opportunity to carry these forward and improve on them. His first statement of the interrelation between plant biology and cotton spinning was in a paper published in March, 1914;† and at the International Conference of Tropical Agriculture a few months later he emphasized the evident importance (in the Yield × Price product) of purity of strain. Thus far he had not made distinction between local and general problems; but in 1918 the distinction appears in print in a discussion of the many kinds of work covered by the word "research."‡ The passage is worth quotation:—

> "Important as it may be to the future of all cotton growers and all cotton users to learn the true nature of the physiological development of the cotton fibre, and the limitations and possibilities of heredity, it is obviously unreasonable to expect any particular cotton growing community to bear separately the cost of such work. It is, indeed, of real importance that this distinction of the kinds of research work necessary should be specially considered in relation to the proper apportionment of the cost."

The Provisional Committee on Research and Education for the Cotton Industry held its second meeting on January 10th, 1917, and approved his suggestion that "the Growth of the Fibre" should be on a par with "Spinning Processes, Fabric Construction, &c.," as a subject for research by the proposed Research Association. At a later meeting he stated, "There is need not merely for work on the growing of cotton, but also for work bearing on the methods by which cotton can be grown to spin well."

The early plans for the Research Association had included the foundation of an Experiment Station in Egypt as a semi-independent organization, with a liaison through the Botanical Department of the Association. A skeleton draft, dated January 4th, 1918, sketches the field for the work of such a station thus:—

> "The relative efficiency and limits of (*a*) heredity; (*b*) environment. How far either can be favourably modified by science. Research in growth and use of cotton must go hand in hand."

The following paragraph shows that by approaching the position from the spinners' side, Mr. McConnel had now recognized that there was scope for general research on cotton growing as distinct from that on local agricultural problems:—

> "Egypt offers an unequalled site for the location of Imperial Institutions devoted to the concentration of knowledge and to

* *Science Progress*, October, 1914; *Worrall's Textile Gazette* November and December, 1914.
† *Textile Mercury*, March 21st, 1914.
‡ *Ibid.*, March 16th and 30th, and April 6th and 13th, 1918.

organization of Experimental Research as to the nature and possibilities of the cotton plant and its product, cotton lint. Such institutions could work in close correspondence with the scientists in other cotton-growing parts of the Empire, and could maintain personal intercourse and collaboration with the consumers in Great Britain and (if necessary) in India."*

Steps were being taken to obtain official opinion from Egypt concerning the possibility of starting work on the Experiment Station when the first overt signs of the Egyptian crisis arrested them. Meanwhile the Empire Cotton Growing Corporation had absorbed Mr. McConnel's energy; and as the B.C.I.R.A. evidently had its hands full with purely industrial problems, it was agreed, through a joint committee of the two bodies, that overseas work, including the Experiment Station, should be left to the Corporation, provided that close liaison could be maintained.

By 1919 the prospect of using Egypt was diminishing, but the need for the creation of a Cotton Growing Research Institute abroad was increasing.

The details of the formation of the Corporation henceforth left Mr. McConnel little time to consider the Experiment Station, and after his death the project flagged. In 1922 it was judged by the Research Committee to be an ideal rather than an immediate practical possibility; but the developing needs of the B.C.I.R.A. enabled the matter to be brought up again through the joint Committee, and a special sub-committee of the Corporation undertook a survey of the Empire for possible sites. Their elimination of every place other than Trinidad, after very thorough examination and careful consideration led the Executive to send Professor J. B. Farmer and Mr. L. G. Killby to report on the possibilities of this island, with the result that it has now been adopted as the site of the Corporation's Cotton Experiment Station.

The following appointments have been made in connection with the re-organisation of the Colonial Office by which a new Secretaryship of State for Dominion Affairs has been created; Brig.-General Sir Samuel H. Wilson, until recently Governor of Jamaica and formerly Governor of Trinidad and Tobago, to be Permanent Under-Secretary of State for the Colonies, Sir Gilbert E. A. Grindle to be Deputy to the Permanent Under-Secretary of State for the Colonies, and Sir Charles T. Davies to be Permanent Under-Secretary of State for Dominion Affairs.

Subscriptions to Lord Milner's Appeal for £100,000 as an endowment fund for the Imperial College of Tropical Agriculture should be addressed to the Secretary, Imperial College of Tropical Agriculture or to the bankers of the Fund, the Colonial Bank, 29, Gracechurch Street, E.C.

* Report on the Cotton Supplies of the British Empire after the War.

"STARVING OUT" THE WHITE ANT.

By Sir Arthur Shipley, G.B.E., F.R.S.,
Master of Christ's College, Cambridge.

Practically all animals have protozoa—*i.e.*, little one-celled animals—living in their alimentary tracts. Some of these are beneficial and some are harmful. But few animals have so many as a termite, or white ant. Dr. Cleveland, working at the John Hopkins University, found that one-half of the body-weight of a termite is made up of swarms of protozoa, and he found that if these were removed from the alimentary tract the insect died of starvation, although it had the food all around it. It simply could not digest. He discovered that you could destroy protozoa in three ways: (1) by keeping them in a temperature of about 95° Fahr. for twenty-four hours; (2) by starving them for a time; (3) by exposing the insects to air or pure oxygen under pressure. Treated in these ways the protozoa perished, but the termites survived only to find a death by starvation. In three or four weeks they had all disappeared. They cannot digest their dry and arid diet of wood or old books without the help of these great colonies of protozoa. Dr. Cleveland recommends ridding a house of termites by closing all the chinks, cutting the termites' line of communication with the outside world, and firing the furnace until you get a temperature of 95° Fahr. or higher. At this temperature the protozoa are destroyed in a day and a night, and the termites disappear in the course of three or four weeks. The higher the temperature the quicker the protozoa are killed. This all sounds like a fairy tale, but Dr. Cleveland's work is obviously regarded as sound, for, in recognition of it, he has received half of the annual prize of the American Association for the Advancement of Science.

The methods suggested above of destroying termites savour a little of the laboratory. But white ants extend at least as far north as Massachusetts, where they have been known, when swarming, to darken the sky. On one occasion the swarm was accompanied by no fewer than fifteen species of birds, some of whom had so gorged themselves with the insects that they could not close their beaks. They are also common around the Mediterranean Sea, and here again the method suggested by Dr. Cleveland might be carried out. But in the tropics termites must often be exposed to a temperature of 95° Fahr., which, in the laboratory, destroys the protozoa. But in warmer regions of the earth both the protozoa and their host, the white ant, seem to flourish at this high temperature. The immense destruction wrought by these insects in furniture, frames of houses and woodwork of all kinds justifies every effort to find a real cure available anywhere. Dr. Cleveland is now seeking a chemical which, when consumed by the insect, will release oxygen in the alimentary canal, and he is by no means without hope that he will succeed in this quest.—"*Country Life*" July 11th, 1925.

TROPICAL WORLD NOTES.

Nigeria.

The Annual Colonial Report for Nigeria during 1924 (No. 1245) shows that the total trade during the year increased by four millions over the previous year and by thirteen millions over 1913, the exports during 1924 amounting to £15,004,874 and imports to £12,635,866. The United Kingdom supplied 71 per cent. of the imports and took 60 per cent. of the exports. The exports of palm oil and palm kernels during 1924 exceeded all previous records by 26,046 tons and 29,846 tons respectively. Cocoa and ground-nut shipments also exceeded all records by 4,375 tons and 20,617 tons respectively, while the cotton lint yield of 92,786 cwt. has only been exceeded once before (1921).

The Resident of the Mandated Cameroons Province reports perfect peace and tempered progress. £225,000 was realised by an auction sale of land.

Two serious epidemic diseases broke out in Nigeria during the year, the first being relapsing fever which appeared in the Northern Provinces and was accompanied by a heavy case mortality. The possibility of its spread Southwards by body lice caused considerable anxiety. The second disease is bubonic plague which broke out in Lagos. Energetic measures were taken to confine the disease to this district and an active campaign against rats begun with such success that by the end of the year it was possible to remove the quarantine restrictions.

Gambia.

The annual Colonial Report for the Gambia during 1924 (No. 1249) shows that ground-nuts accounted for 96·48 per cent. of the total exports. The crop was smaller than usual, due largely to the fact that the low price of £10 a ton, or 2*s.* 6*d.* a bushel, was offered by the merchants to the farmers at the commencement of the buying season in January, when higher prices were offered by French competitors in Senegal. It is evident that the completion of the railway lines in French Senegal will radically affect the number of "strange farmers" who enter the Protectorate each year to cultivate ground-nuts and return to their homes with the proceeds of their labours. Already the number of "strange farmers" has declined from 24,150 in 1920 to 14,188 in 1924. During the "boom" year of 1920 84,037 tons of nuts were valued at £2,322,032 exported, while the corresponding figures for 1924 were 60,622 tons valued at £831,925, being slightly less than in 1923. The exports of palm kernels were nearly doubled during the year, but the destruction of the palms by bush fires and excessive tapping for palm wine, is causing great anxiety. Unless prompt action is taken it is believed that palm kernels, like rubber, will cease to figure among the exports. The lime tree is found growing under semi-wild conditions in the Protectorate and experiments are being made at Cape St. Mary with a view to the establishment of an industry in this fruit in the Gambia.

Weihaiwei.

The annual Colonial Report for Weihaiwei during 1924 shows that this Territory has been independent of Imperial Grants-in-Aid since 1921-22, and it is not anticipated that any will be necessary during the current year. On the other hand it is pointed out that considerably increased expenditure must be anticipated if the Territory remains under British Administration. Business was brisk in the spring but became slack in the autumn owing to the Civil War in China. Money is scarce owing to the fact that higher rates of interest are obtainable elsewhere. Ground-nuts and ground-nut oil, both of which showed a substantial increase, are the main exports. The increase of lawlessness and brigandage in the neighbouring Chinese Province necessitated increased vigilance by the police. It is a matter of regret to note that the conduct of the police has been somewhat unsatisfactory. This is attributed to the reduction of foreign supervision consequent upon a drastic reduction in the Government staff as a preliminary to the return of the Territory to China. An increased number of police is anticipated in the present year.

Iraq.

The production of cotton during 1924 exceeded 2,500 bales, against 1,500 bales for 1923, and 350 bales for 1922, and the quality of the cotton is excellent. Approximately 130 tons of seed were sold for sowing during 1924, in addition to eight tons which was issued free to replant in cases where the first planting had been destroyed by locusts, and it is considered that at least 90 per cent. of the seed issued has been actually planted.

Among various factors which hinder cotton development in Iraq is soil salinity, and it is unfortunate that even the new canals have been laid out without previous soil surveys being made of the areas to be commanded. Increasing salinity was only to be expected in the absence of drainage, but the rapidity of the increase is a serious matter and cannot be ascribed to the actual salt evaporated from the water put on the land during the last few years, but rather to the alteration of the level of the sub-soil water and the bringing up of salt from below. It is only by progressive and well-planned drainage schemes that deterioration can be avoided, but in spite of these drawbacks the cultivation of cotton will continue to increase, but it must not be expected that the increase will be rapid.

Whilst the indications are that progress in Iraq will be somewhat slow, owing to lack of drainage, irrigation and shortage of population, there can be no doubt that the work of the British Cotton Growing Association in the Country is established on a firm basis and a steady increase in the production of cotton may be looked for. In order to deal with the increased production, a large up-to-date pneumatic ginning plant, together with a standard Hydraulic Press, was despatched to Baghdad, and the storage accommodation has been enlarged.—(*Annual Report of the British Cotton Growing Association for* 1924.)

Southern Rhodesia.

Although in times past Southern Rhodesia has been more particularly noted for its mineral output, yet to-day, notwithstanding the fact that the annual value of her mining products amounts to about four and a half millions sterling, farming is the premier industry, nearly double the number of Europeans following this calling as compared with mining. Practically all the food requirements of Southern Rhodesia are now produced locally, and there is a steadily growing exportation of maize and cattle products. Great possibilities exist for the extended cultivation of both cotton and tobacco. Already these crops are grown over a large area, and there must be several millions of acres suitable for the cultivation of these plants which are at present untouched. Some idea of the progress that is being made in cotton growing can be gained from the fact that, whereas in 1923-24 the total area under cotton in the Colony was 3,000 acres, for the present season the acreage has increased to no less than 70,000 acres, with prospects of a still further expansion next season if the results again prove satisfactory. Progress in tobacco planting is more slow, but now that serious efforts are being made to establish a market for Rhodesian tobacco in Great Britain there is much encouragement for the farmers to increase the present area devoted to tobacco. With care in growing, provided conditions are normal, some Rhodesian farmers have obtained returns as high as £75 to the acre. One factor most favourable for the development of both the cotton and tobacco crops is the cheap and plentiful supply of native labour.—(*Chamber of Commerce Journal*, Vol. XLIX, No. 587.)

British Honduras.

Mr. C. L. Stocker, Assistant Conservator of Forests, states, in the Handbook of British Honduras, that of the total area of about 5½ million acres of land in the Colony some 4 million acres consist of forest land of which roughly 2½ million acres are workable mixed high forest, containing mahogany, and 1½ million acres of practically pure pine forest. The chief industry of the Colony for some 200 years or more has been the export of mahogany and cedar. Logwood was formerly very important but has been reduced to comparative insignificance owing to the competition of synthetic substitutes. British Honduras mahogany has a very high reputation, but the yearly exports which average some 25,000 tons, are modest in comparison with the extent of available forest areas. Regular and systemmatised exploitation was unknown until recently, the operations being haphazard and of brief duration largely owing to the high cost of extraction. Granted sustained felling operations and improved transport facilities costs could be considerably reduced.

Next in importance to mahogany is the well established trade in Chicle, the coagulated latex of the Sapodilla (Anchras Sapota) which is the raw material for the manufacture of chewing gum. Past workings have been sporadic and without protection from excessive tapping. By establishing fully stocked sapodilla forests costs of production and of transport would be reduced.

An investigation of the forests resources of the Colony in 1920 and 1921 by C. Hummel resulted in the formation of a Forest Department in 1922. The need of adequate means of communication is recognised as being of prime importance, and one of the chief aims of the Forest Department will be to explore forest areas in search of the traffic necessary for supporting light railways. Satisfactory progress is being made. The other main branch of the Department's work is the restoration of the exploited mahogany forests and burnt over pine lands, and the general improvement of the stock of valuable species in the high forests.

West Indies.

The text of the new trade agreement between Canada and the West Indies has recently been issued. By the agreement the Canadian duties on West Indian produce, other than tobacco and liquors, are not at any time to be more than 50 per cent. of the duties imposed under the general tariff on similar goods coming from foreign sources. There is a reciprocal but varying undertaking on the part of the Colonies. To secure full benefits Colonial produce must be shipped direct into a Canadian port, thus eliminating the United States of America as a middleman. The preference on refining sugar is increased by seventeen cents to one dollar. Canada has agreed to withdraw the benefit of the British preferential tariff from any British country producing cacao beans which does not grant a satisfactory preference to Canada. The Canadian Government is to provide a fortnightly mail, passenger, and freight service from Canadian ocean ports by vessels of 5,000 to 6,000 gross, equipped with cold storage of not less than 10,000 cubic feet. These vessels will call at Bermuda, St. Kitts, Nevis, Antigua, Montserrat, Dominica, St. Lucia, Barbados, St. Vincent, Grenada, Tobago, Trinidad, and British Guiana. Freight rates will be determined by the Canadian Government. For the Western group a fortnightly mail, passenger, and freight service calling both ways at Bermuda, the Bahamas and Jamaica, is to be provided, by vessels of 5,000 to 6,000 tons steaming 12 knots, and with refrigeration for 70,000 stems of bananas. In addition a fortnightly 10-knot steamer of 1,000 tons with passenger accommodation and cold storage is to be maintained between British Honduras and Kingston. The Colonial contributions toward these services vary from £12,000 in the case of Jamaica to £1,500 in the case of Bermuda. When approved by the Canadian Parliament, the Legislatures of the respective Colonies, and the Secretary of State for the Colonies the agreement will come into force by proclamation for a period of twelve years, and thereafter until terminated by twelve months' notice by any of the signatory parties.

CLAUDE TINNÉ BERTHON, A.M.I.C.E.

ALGERNON E. ASPINALL, C.M.G., B.A.,
Secretary to the Governing Body.

THE Imperial College of Tropical Agriculture has suffered a severe loss through the death of Mr. Claude Tinné Berthon which took place with painful suddenness at Bexhill on July 29th, for it was he who was mainly responsible for the successful establishment of the Instructional Sugar Factory at St. Augustine.

Born on December 3rd, 1859, at Halton in Cheshire he was the eldest son of Captain Charles Harrison Berthon, late of the Indian Navy, and Anna, eldest daughter of John A. Tinné of Liverpool, a Member of a family long and honourably connected with British Guiana. Educated at Clifton College and King's College, London, where he gained a scholarship, Claude Berthon underwent a training in engineering with the firm now the Mirrlees Watson Co., Ltd., and in 1885 he proceeded to Demerara as Engineer to Messrs. Sandbach Tinné & Co. of the sugar estate proprietors. He remained there for fifteen years and when in 1900 he returned to England, on account of his health, he set up a successful practice in London as Consulting Engineer in which capacity he was employed by many well known firms including the late Colonial Co., Ltd., Messrs. Henckell Du Buisson & Co., Messrs. Curtis Campbell & Co. and Messrs. Henry K. Davson & Co. He was closely concerned with the erection of the central sugar factories in Antigua and St. Kitts and with the remodelling of the Usine St. Madeleine in Trinidad; but the crowning work of his life was the factory at St. Augustine. Gratuitously and without any expectation of commendation or reward he designed the building and, what is more, carried on the negotiations which led to the gift by the British Sugar Machinery Engineers of machinery for it to the value of fully £20,000. It is not too much to say that he was completely wrapped up in the factory, to the successful completion and equipment of which he devoted many months of study and careful thought. He watched it grow as if it were his child and no detail was too small to receive his attention and it was one of the proudest days in his life when the cablegram was received stating that the factory had been opened and that the mill had successfully "gone about." Gifted with a charm of manner and a sympathetic personality Claude Berthon had many friends who will at least rejoice to know that he lived to see the fruition of his Imperial work, which would no doubt, in due course, have received the recognition in official quarters which it deserved. He leaves behind him a widow—Annie, daughter of Mr. William R. Hayes of South Devon—one daughter, now Mrs. C. A. McNeil, and two sons, Lieut.-Commander Charles P. Berthon, R.N., and Lieut.-Commander E. Lyon Berthon, D.SC., R.N., for whom much sympathy will be felt.

H. MARTIN LEAKE, M.A., SC.D. (CANTAB.), F.L.S.; *Principal.*

IT is only fitting that we in Trinidad should join in an expression of deep regret at the news of the death of Mr. Claude Tinné Berthon. It was not my privilege to know Mr. Berthon well but even in the few times in which I met him it was not possible to be anything but struck with his charm of manner. But if this privilege was not mine, I have at least seen, and been able to appreciate, the product of his energy in the Model Sugar Factory now in being at the Imperial College. Planned by him and erected by Mr. G. Mayes under his direction, it has stood, and stood well, the test of its first season's work. Those who are familiar with the commercial factory are aware of the numberless points that arise in the first season's working and they are in a position to appreciate the skill which has designed a balanced factory with but a few parts standard, to run its first season without a single material stoppage. Yet this is what has been accomplished and it is our duty to make the fullest use of the priceless gift he has given us. That he has not been spared to see his creation reach a maturity, when there will be few factories in the Empire which have not a representative trained in it, is a sufficient cause for regret and the sympathy of the whole staff is offered to those relatives he has left behind. To quote the words of one of the College Governors to me "he was too good for this world."

THE ISOELECTRIC THEORY.

Its Application to Certain Problems of Crop Products Manufacture, and Soil Fertility.

By Professor F. Hardy, M.A.

[*This article forms the Third Part of a series of articles that attempt to apply a modern theory of colloidal behaviour to some tropical agricultural problems. Part I of the series appeared in the August, 1925, issue of this Journal; in it the Isoelectric Theory was stated and explained, and consideration was given to the general question of the precipitation of hydrophilic colloids by certain added electrolytes. Part II appeared in the last (September) issue; it comprised a description of the physical chemistry of coagulation in rubber latex, based on the isoelectric theory.*]

PART III.

II.—APPLICATION OF THE ISOELECTRIC THEORY.—Continued.

(*a*) Manufacture of certain crop products.—(*Contd.*:)

2.—*The Defecation of Sugar-cane Juice.*

The main object of the defecation process in the cane sugar factory is to remove as large a proportion as possible of the colloidal components of cane juice, otherwise unsatisfactory viscous syrups of excessively dark colour may be obtained, in which it is difficult to induce proper crystallization of sucrose. The principal colloidal substances that occur in fresh cane juice are proteins, pentosans, pectins, colouring matters, hydrous silica, waxes, fats and soaps. In addition to these, varying amounts of different colloidal decomposition products of celluloses, such as pentosans and pectins, are generated during shredding, milling and maceration, and even during defecation itself, through hydrolysis and breakdown of the components of minute particles of fibre (bagacillo) that pass the juice strainer.

The colloids of cane juice exhibit various degrees of hydrophily; thus, the protein, pentosan and pectin components appear to be very *highly* hydrated, whilst colouring matters, silica and fatty substances are probably only relatively *slightly* hydrated. We should therefore expect in accordance with our preliminary considerations, marked differences in behaviour in the two types of colloids during factory treatment of sugar-cane juice.

Type a :—Highly hydrated colloids of sugar-cane juice.

(1) *Proteins.*

The soluble protein component of cane juice (comprising some 9 per cent. of the total non-sugar solids), is probably mainly albumin, along with its products of hydrolysis or of intermediate metabolism, namely, proteoses (albumoses), peptones, polypeptides and amino-acids. Albumin is altered or "denatured" in some way by heating. The denatured product, unlike the natural substance, appears to be relatively lightly hydrated; it, therefore, exhibits marked amphoteric properties, as was shown by W. B. Hardy in his experiments on boiled egg-white previously considered. Hence, one important effect of heating sugar-cane juice, is to render its albumin component more susceptible of precipitation, either spontaneously (particularly at the isoelectric point), or through combination with certain added simple ions such as calcium-ion. The importance of the first effect has been sufficiently stressed by Farnell (1).

Proteoses and other simple associations of amino-acids, are not strictly colloidal. They are probably little affected (dehydrated) by heating. Nevertheless, they play an important rôle, along with the higher proteins, in that their amphoteric properties "buffer" sugar-cane juice against changes in acidity or alkalinity, and thus protect it from the deleterious effects of excessive liming.

(2) *Pentosans.*

Unlike albumin, pentosans ("cane gum"), in aqueous dispersion, are apparently not denatured (dehydrated) by heating. Their stability in the highly hydrated condition, therefore renders them particularly capable of resisting precipitation during the ordinary processes of defecation, so that pentosans form a conspicuous component of final syrups and molasses. The relatively low concentration at which simple ions occur in sugar-cane juice which has been treated with the various electrolytes (such as lime), that are employed in the cane-sugar factory, is probably ineffectual in producing the so-called lyotropic precipitation effects discussed in a previous section.

In practice, partial elimination of pentosans from sugar-cane juice may apparently be brought about either by generating some highly reactive flocculent solid within the juice, or by adding to the juice a suitable substance previously prepared for the purpose. It is believed that, in both cases, the solid "adsorbs" some of the pentosan, and, by entrainment, removes it from the juice on subsequent settling or filtration. Amongst the adsorbent substances recommended for precipitation *within* the juice, the following may be mentioned:—(*a*) calcium carbonate (carbonatation process, lime and carbon dioxide employed); (*b*) calcium phosphate (lime and phosphoric acid); (*c*) hydrous alumina (aluminium sulphate and alkali), and (*d*) hydrous magnesia (magnesium acetate and ammonia). Amongst the adsorbent substances to be *added to* the juice are recommended (*a*) Kieselguhr (Filter Cel); (*b*) calcium carbonate (from lime and sodium carbonate); (*c*) calcium sulphite (from calcium hydrogen sulphite solution); (*d*) hydrous aluminium silicate, and (*e*) sodium "aluminate."

There is some doubt as to the relative efficiency of these various agents as pentosan removers, and further specific investigations are urgently needed to test their value. Some authorities maintain that effective adsorption by solid particles of even such highly hydrophilous colloids

as pentosans, is partly controlled by reaction, being especially favoured by acidity. The writer recently examined the effect of simple ions on solutions of pure araban at different pH values, and noted that certain ions which tend to produce cloudy precipitates were especially effective in the more highly acidic solutions (pH 2·5 to 3·9). This result probably depends, however, on a suitably high concentration of pentosan, but at least it indicates a *tendency*. Nevertheless, one should regard adsorption at a surface primarily as a function of the reactivity of that surface, although doubtless both this factor, as well as the tendency of a colloidal solution to separate into its phases, are conditioned largely by external circumstances, in particular, by hydrogen-ion concentration. Adsorbents such as hydrous calcium phosphate and hydrous aluminium silicates are themselves colloidal substances, and may indeed be amphoteric. This property may actually account for the differences in reactivity which these adsorbents exhibit in environments of different hydrogen-ion concentration, for it has already been shown that the reactivity of a true colloidal ampholyte depends on the difference between the pH value of its isoelectric point and that of the enveloping medium. In all these effects, the distribution of water between adsorbent and adsorbate may play a fundamental rôle, for precipitation of highly hydrophilic colloids at a reactive surface is probably always preceded by dehydration.

Apparently insufficient attention has been given by sugar technologists to the fundamental question of adsorption at surfaces in relation to the efficacy of clarification processes in cane-sugar manufacture. Indeed it appears from the very recent work of Bond in Hawaii (2) that defecation by liming is primarily a function of the phosphate content of sugar-cane juice, for, the higher the phosphate content, the greater the quantity of flocculent hydrous calcium phosphate produced, and the better the defecation. Herein may lie a definite relationship between soil conditions, manurial treatment and sugar factory experience, for agriculture can no longer be regarded as entirely divorced from tropical crop products manufacture.

(3) *Pectins.*

Because of their high degree of hydration, pectins somewhat resemble pentosans in their behaviour during sugar manufacture, but, because of their different chemical constitution, they exhibit certain peculiar features which are worthy of special mention. The unsatisfactory state of our knowledge concerning the constitution and mode of occurrence in plants of pectic substances, has been considerably corrected by recent researches (3), but much still remains to be done from the point of view of colloid science.

Pectin occurs in plants probably as an insoluble "salt" (protopectin) containing calcium, magnesium and perhaps iron (4). During ripening processes, protopectin may become "soluble" (yielding pectinogen), and finally, through hydrolysis, de-esterification may occur, resulting in the formation of a new substance (pectic acid). Chemists have explained these changes mainly without reference to colloidal behaviour. It is perhaps justifiable to assume, however, that the so-called protopectin salt is actually a colloidal complex rendered insoluble by surface combination with precipitating ions (Ca, Mg, Fe,), acting in a medium of reaction alkaline by reference to an isoelectric point. When the medium is rendered more acid, the metallic ions may be progressively replaced by hydrogen-ions, so that the colloid finally becomes "soluble," *or* the anions of the added acid may remove the adsorbed metal ions by forming insoluble simple salts therewith (for example, oxalic acid gives insoluble oxalates). Once in solution, pectinogen might behave in a reverse direction under the influence of altered reaction and of added metallic ions. Thus, in the defecation process, the pectinogen present in sugar-cane juice may be partly eliminated by the combined effect of heat and lime—the one causing dehydration, and the other precipitation, through increased hydroxyl-ion and calcium-ion concentration. It is quite likely that pectinogen is much more prone to dehydration on heating than are pentosans. Farnell (5), however, interprets pectin precipitation differently. He assumes that liming actually hydrolyses (de-esterifies) the pectinogen of cane juice, producing pectic acid, and that this then forms insoluble "calcium pectate." In any event, pectic substances appear to be effectively eliminated in the ordinary defecation process, in which respect they differ from pentosans. The total pectinogen content of sugar-cane juice rarely exceeds 1½ per cent. of the total non-sugar solids (compare 9½ per cent. for pentosans), so that usually little trouble is experienced in removing them completely.

Type b :—Slightly hydrated colloids of sugar-cane juice.

(1) *Colouring Matters.*

Not much appears to be known about the physico-chemical properties of plant pigments; most of the work so far accomplished has been concerned mainly with the elucidation of their chemical composition and structure. The soluble plant pigments occurring in sugar-cane juice comprise a catechol tannin and, in some cases, certain red and purple anthocyanin-like compounds. These substances are little removed during ordinary defecation processes, but require powerful adsorbents, such as decolorizing carbons, for their complete elimination. They can scarcely be regarded as typical hydrophilic colloids, and are perhaps best classified as semi-colloidal compounds possessing the properties of indicators.

During defecation, various other colouring matters are produced in sugar factory liquors, especially when cane juice is limed to relatively high alkalinity. Most of these secondary pigments appear to be cyclic compounds of "humin" type, and may be derived, either from the lignin

component of cane-fibre, ligno-cellulose, or from reducing sugars. Little is known of their constitution and properties, beyond the fact that powerful adsorbents are required to remove them from solution.

(2) *Hydrous Silica.*

Silica occurs in plants mainly as a hydrophilic colloid, either in the free state, or combined with other colloids. In addition, silica occurs in smaller amount in ester-like combination with some polysaccharide component of the plant, in much the same manner as sulphate and phosphate may occur (6). In order to render the silica component of cane juice completely precipitable, it has been found necessary to superheat the juice to 116°C (7). The precise effects of this operation are not clearly described in literature. They may be two-fold (1) hydrous silica may be detached from colloidal combination through diminished hydration, and (2) the true organo-siliceous compounds may be hydrolysed (de-esterified) by the heat treatment. In any case, gelatinous hydrous silica is probably thus liberated in the free state into the juice.

The physico-chemical properties of hydrous silica will be discussed when the colloidal components of soil are considered. Suffice it to state here that there is some evidence to support the view that hydrous-silica is a colloidal ampholyte, exhibiting an isoelectric point at approximately pH 1·2. Hence, free hydrous silica dispersed in previously superheated cane juice, is exposed to an environment whose reaction is well on the alkaline side of its isoelectric point. The colloid will, therefore, behave as a highly active colloidal anion, and will readily combine with calcium-ion to form an insoluble calcium-silicate complex. In this way, liming and settling effectively remove all free hydrous silica from cane juice that has been suitably preheated.

(3) *Waxes, Fats and Soaps.*

Waxes and fats occur in sugar-cane juice probably as anhydrous (suspensoid, hydrophobic) colloids, or at least as only slightly hydrated colloids. In themselves, they are not amphoteric compounds ; indeed they are scarcely soluble in water. Nevertheless, because of their fine state of subdivision, they exert a marked effect in retarding filtration of sugar liquors. They are also troublesome in that they produce evaporator-scale. When acted upon by alkalies, fats and waxes, as is well known, form soaps. Soaps may exhibit hydrophilous properties to a marked degree. Thus ordinary sodium soap behaves as a hydrous colloidal electrolyte, yielding sodium-ions and colloidal fatty-acid anions on dissociation. The sodium-ions of soaps may therefore be combined chiefly at the surface of colloidal anions, and may be susceptible of replacement by, say, calcium ions, yielding insoluble complexes (calcium soaps).

In sugar manufacture, hydrolysis of waxes and fats doubtless occurs as a result of heating at certain (relatively alkaline) reactions, but the use of lime effectively prevents any manifestation of hydrophilic behaviour, because insoluble calcium complexes are immediately produced. Nevertheless, even floccules of calcium soap appear still to hinder filtration, because of their greasy nature, so that the addition of some mechanical aid, such as Filter Cel, is often found necessary in order to effect easy elimination of fats and waxes from sugar liquors.

It is evident from the foregoing discussion, that the application of the isoelectric theory of colloids to the complex system, sugar-cane juice, brings out many obscure interrelationships, whose recognition helps the student not only to visualize the various changes that occur during defecation, but also to suggest fresh research along lines that might lead to improvement in existing methods.

(To be continued.)

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(6) Nangi and Shaw, *Journ. Soc. Chem. Indus.*, 1925, 44, 1, p. 1 T.
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PINEAPPLES IN PORTO RICO.

The Porto Rico Agriculture Experimental Station at Mayaquez has recently issued a series of articles on Pineapple cultivation in Porto Rico by Henry C. Henricksen. Pineapples were first grown here on a commercial scale about 25 years ago following experience gained in Florida. The production of Cabezona pineapples at Palmarcjo is stated to have been 140,000 fruits in 1904. The same variety was tried by the early planters in the coastal plain from Rio Piedras to Archibo but was soon discarded in favour of the Red Spanish which has become the main commercial variety. The production has fluctuated very considerably. In 1910 277,000 boxes were exported increasing to 552,000 boxes in 1915. A considerable decline to 141,000 boxes in 1920 followed, but since then production has been increasing, exceeding 270,000 boxes in 1924.

These fluctuations, together with the slow development in general, are attributed to a lack of understanding of a number of problems. Under favourable conditions the pineapple proves one of the most remunerative crops. The articles deal mainly with the various soil problems which are of greatest importance during the first few months after planting. When the plant becomes large enough to cover the ground, conditions are entirely changed, washing, bleaching and crusting being eliminated, and evaporation from the soil greatly lessened.

CHEMICAL NOTES.

Compiled by the Department of Chemistry and Soil Science.

Tree-ferns as a Commercial Source of Starch.

It has been demonstrated in Hawaii by Dr. J. C. Ripperton that the chemical composition of the core of the tree-fern is similar to that of many other starchy plants such as Canna. Tree-fern starch is useful both in the kitchen and in the laundry, being superior in the latter respect to corn starch. The rate of growth of the tree-fern is so slow, however, that its exploitation as a commercial crop is probably not feasible. (*Hawaii Station Bulletin*, 1924, No. 53.)

Rubber Latex Paper.

Comparisons recently made between paper that had been sized in the ordinary way and paper that had been treated with rubber latex, have shown that latex paper deteriorates upon ageing much more rapidly than ordinary paper. Its resistance to stretching and to cracking by folding are diminished on keeping, probably because the rubber substance slowly alters into resins on exposure to the oxidizing action of air.—J. M. Arnot, *Rubber Age*, 1924, 5, p. 398.

Power Alcohol and Sugar Production.

Those interested in the future of power alcohol will be interested to learn that the Australian Sugar Producers' Association is being supported by the Australian Government in its decision to establish a large alcohol distillery.* This plant will have a capacity of half-a-million gallons, but its erection is merely the first step in an ambitious project which aims at the complete displacement of petrol as a motor fuel in Australia. The average price of petrol is 2*s*. 6*d*. to 2*s*. 9*d*. per imperial gallon in Australia. It is believed, however, that power alcohol can be put on the market in drums at 1*s*. per gallon. The raw materials to be used are molasses, cassava, corn, sorghum and sweet potato, but especially the two first-mentioned. For this purpose, steps are being taken to establish a cassava-growing industry on a large scale. Twelve to twenty-two tons of raw material can be obtained per acre, and the lower of these figures would give as much alcohol as sugar-cane at the rate of twenty tons per acre.

The Stream-line Filter.

The Hele-Shaw Stream-line Filter, described in this journal in the March, 1924, issue (Vol. I, No. 3, p. 44), has been improved by altering the shape of the paper sheets from square to narrow-rectangular. This renders the stream-line principle readily applicable to the filter press.

An experimental rotary self-cleaning stream-line filter was recently exhibited in London by Mr. J. H. Pickard (see *Chemical Trade Journal*, 1925, No. 1,965, p. 71). The original laboratory type has also been replaced by a new type in which the operator can watch the filtration through an opening in the case. The liquid to be filtered is forced through the filter by compressed air from a bicycle pump.

According to a communication to the *International Sugar Journal*, March, 1925, p. 163, experiments have been carried out in the West Indies on the possibilities of applying the stream-line filter in sugar manufacture. The results show that the filter removed not only colloidal matter from a defecated raw juice, but some colouring matter as well. It did not remove sugar. This experience is stated to have been confirmed in Hawaii.

Some new Nitrogenous Fertilizers.

The development of new chemical industries, and the perfection of existing processes for the manufacture of fertilizer compounds, adds yearly to the list of soil amendments that come within the sphere of economic agricultural practice. Thus, recent progress in atmospheric nitrogen fixation has added ammonium phosphate, ammonium chloride, hydrocyanic acid and sodium nitrite to the already well-known synthetic products, calcium nitrate and ammonium nitrate, that have long been manufactured by the arc method.

The famous Badische Anilin und Soda Fabrik of Germany, in addition, now manufactures double salts, such as ammonium sulphate-nitrate and ammonium-potassium nitrate, in commercial quantities. Especially interesting is the large scale production of urea by the Badische Company, which has perfected a process for obtaining urea from calcium cyanamide by treatment with sulphuric acid.

Urea contains 46 per cent. of nitrogen, and is the most concentrated form of nitrogenous fertilizer that has so far been put on the market. Unless carefully prepared, however, crude urea may contain certain plant poisons, but due effort is being exerted to reduce the content of these toxins to a minimum.

In recent years, certain of the new fertilizers have been thoroughly tested, notably at the New Jersey Experiment Station. Results of these trials are recorded in *Industrial and Engineering Chemistry*, February, 1925, p. 190, in an interesting article by Drs. Lipman and McLean. The conclusion herein is drawn that among the more concentrated synthetic nitrogenous fertilizers, urea is to be especially commended because of its high nitrogen content, its low hygroscopicity, and its comparative safety. If made from ammonia and carbon dioxide, urea is entirely free from toxic substances, but if manufactured from cyanamide, it usually contains appreciable amounts of dicyanodiamide and guanyl urea sulphate, which may cause injury to crops. The product, however, may be so made as to contain relatively small quantities of these objectionable impurities, in which case it is a very effective nitrogenous fertilizer. Besides urea, synthetic ammonium phosphate and ammonium chloride are stated by Lipman and McLean to give promise of great usefulness.

* "*Facts about Sugar*," *May 30th, 1925, p. 524.*

CORRESPONDENCE.

We have received the following letter from a correspondent in America. The facts to which he refers are, we are afraid, only too correct. It may be stated, however, that the Empire is at last waking up to the position. A committee of Imperial Research, is now sitting in London for the purpose of studying questions of this nature. Its efforts have materialised in the recent grant of a preference to raisins.

The question of fruit is, however, more complicated. For transport, special storage facilities are required on the ships, and such special facilities will not be forthcoming without a sufficient volume of produce well in sight. Again for the English market, graded fruit is essential.

The governments of Canada, New Zealand, Australia and South Africa have all taken control over grading and their standards are accepted by the English market. A similar development must take place in the supply of tropical fruits. A volume of graded fruits must appear concurrently with the shipping facilities. This is one of the many problems which appear to come within the comprehensive scope of the Imperial Economic Committee.

To the Principal, Imperial College of Tropical Agriculture.

My Dear Sir,

As a native of the island of Barbados, and a resident in the States for over forty-four years, may I be granted the privilege to call your attention to the following press dispatch emanating from Los Angeles ?

"LARGE ORANGE SHIPMENTS.

Los Angeles,
May 25th (*Staff Corresponding*).

Valencia orange shipments from California to the United Kingdom and Continental Europe during 1924 totalled 54,802 cases, according to reports received at the headquarters of the California Fruit Growers Exchange here from the London Office of the co-operative. Of these shipments, 46,748 cases went by way of the Panama Canal in 10 sailings, and 8,054 by rail to New York, shipped in four sailings."

(*From the Christian Science Monitor.*)

There is another reason why I desire to call attention to the news item in regard to the shipment of California oranges to Great Britain's Markets.

In the June 4th issue of the *Weekly Illustrated London Times*, a Staff editorial writer has called attention to a comparison of some of the fruit products from Australia, New Zealand, Canada with products grown in California, and to be found both on exhibition at Wembley and for sale in Covent Garden. The writer calls attention to the fact that Britain spends annually £700,000 for apples, and notwithstanding British Columbia produces the finest apples in the world Britain spends over £200,000 more for apples grown in the United States. More than this, the writer states, that Britain buys her oranges from California, not because the British prefer to patronize the foreign markets but, "because of the fact that California oranges are clean, symmetrical and neatly wrapped in wrappers bearing the address of the producing association just as if the California orange was proud of its home origin." And, adds to the *Times*, it is the same thing with raisins. New Zealand grows some of the finest grapes in the world, but we buy the California raisins because they are neatly packed in packages.

I am wishful of drawing attention to these facts, because there should be no good reason why the fruit grown in Britain's Colonies should not be marketed in just as proper condition as the fruit shipped from here to the London Markets. No doubt, as the *Times* says, the British buyers would prefer their own home grown products, but because of the inferior method of packing they are forced to buy elsewhere.

With every good wish for the British Shipper, the California Shipper and Yourself.

I beg to remain,
Yours very Cordially,

(Sgd.) E. W. CARRINGTON.

4657 Mississippi Street,
San Diego, California.

THE COLLEGE.

Meeting in Manchester.

From the *Manchester Guardian.*

Following a deputation which waited on Mr. Amery in London on July 7th to urge the claims of the Imperial College of Tropical Agriculture to the continuance of Government assistance on an extended scale, Lord Stanley entertained a small company of influential business men at an informal luncheon at the Midland Hotel on July 14th with the object of encouraging friendly discussion as to the best means of obtaining further support from the Manchester district.

Lord Stanley laid stress on the importance of Lancashire supporting the College as a business proposition. It was of the utmost importance, he said, that a suitable training should be given to those with whom the future of the British cotton industry lay. He read a letter from Colonel George Schuster (Financial Secretary to the Sudan Government), who emphasized the fact that for the success of large development schemes in countries like the Sudan it is not sufficient merely to provide capital, transport, irrigation, and administrative supervision. All these may be wasted if agricultural knowledge is lacking, or improperly applied. "The Imperial College of Agriculture" added Colonel Schuster, "appears likely to satisfy a long-felt want, and is capable of rendering a service of vital importance to the development of the Empire. A course of training at this institution should prove of the greatest value not only to those who undergo it, but to the countries in which they are to work."

Sir James Currie, representing the governing body of the College, summarised the objects and needs of the College, laying stress on its more immediate requirements, which were £25,000 for the provision of a hostel to accommodate the candidates for appointments in the Colonial agricultural departments who would be trained there, and £25,000 for research estate. The Empire Cotton Growing Corporation had decided to establish their research station in the neighbourhood of the College in Trinidad. To the cotton industry the provision of a highly trained staff on the plantations was as important as that of communications. To this his Corporation and the Colonial Office attached the greatest importance. The College now has as its Principal, Dr. Martin Leake, who enjoyed a wide knowledge of tropical agriculture and especially of cotton in all its branches.

Lord Emmott emphasized the point that support for the College was a matter of business. He considered it of great importance that it should be supported.

In reply to inquiries by Mr. Howarth and Mr. Brooks, Mr. Algernon Aspinall, Secretary of the College, stated that the Colonies were being invited to contribute towards the maintenance of the College, and indeed those in the Caribbean area were already contributing one-half of the 1 per cent. of their average revenues for the preceding three years which brought in from £13,000 to £15,000 per annum. Similarly other industries besides cotton were supporting the Institution ; the sugar machinery manufacturers, for example, had supplied plant to the value of £20,000 while cocoa and sugar planters had contributed upwards of £50,000.

He suggested that Lancashire could help in two ways : by supporting the appeal to the Government for financial assistance for the College, and also by contributing in response to the special appeal issued by the late Lord Milner and Lord Burnham for the bill towards the cost of essential requirements, for it was most undesirable that the College should be in any sense a Government organization.

Lord Stanley, summing up the discussion, admitted that it was not a very suitable moment for appealing for funds from Lancashire, but he added that he would regard contributions to the College as being in a sense a cheap form of insurance.

We have been favoured with a copy of the artistic souvenir programme of the Royal Agricultural Show recently held at Chester. This reproduction is copiously illustrated by photographs of the leading personalities in English agriculture and contains a number of short articles on problems of vital importance to the farmer. Dr. H. Martin Leake contributes an article on the Imperial College of Tropical Agriculture, illustrated by a photograph of the new College building.

THE WEST INDIES.

Lord Lamington recently raised in the House of Lords the question of improving the shipping communications between England and the West Indies, and also the inter-communication between the West India Islands themselves. The bulk of the bananas produced in Jamaica, for example, go to the United States of America and not to England and the Jamaicans desire a more independent service for the purpose of marketing their fruits in England. The direct communication between England and the islands of Barbados and Trinidad, and British Guiana is not bad but it is highly desirable that a regular service to the Leeward and Windward Islands should be instituted. At present Jamaica is completely cut off from communication with the rest of the West Indies.

Lord Burnham, another great friend of the West Indies, stated that inter-island communication depended almost entirely upon Canadian goodwill and self-interest. He desired to direct main attention to Jamaica, the whole of the immediate development of which looked as if it would eventually pass to the United States. Parliament would soon have to decide whether in fact, if not in form, the West India Islands would have to remain part of the British Empire. Bananas had been, in a sense, the salvation of Jamaica and it would be ungrateful and unfair to deny the debt of gratitude which Jamaica owed to the United Fruit Company. On the other hand there was a monopoly of transport to-day and the banana growers were unable to find a market in this country. He asked their lordships to consider whether a good case had not been made out for assisting Jamaica to help herself by opening up possibilities for transport other than those given her by the United Fruit Company and by communication to the home markets rather than exclusively to North America.

Lord Olivier stated that forty years ago there was a reasonable and a rational service of communication with the West Indies under the contract with the Royal Mail Steam Packet Company for which the Company received a subsidy of £80,000 a year. A main line of steamers went to Barbados and from there three lines radiated, one to the Leeward Islands, one to Trinidad and the Windward Islands and the third down to Demerara, while the main line steamers went on to Jamaica, and from Jamaica a small steamer went on to British Honduras. That was an admirable service but unfortunately the traffic in the West Indies went down and the facilities had to be reduced. The Earl of Clarendon, replying on behalf of the Government, stated that the Imperial Shipping Committee had carefully investigated applications by the West Indies in regard to a direct service but in practically every case the trade was really not sufficient to justify the Committee in taking any action. Pending the report of the Imperial Economic Committee and the result of the Ottawa Conference he could not usefully add anything further.

THE COLONIAL OFFICE.

Another stage in the development of the Empire was marked by the announcement that it was the intention of the Government to create a new Department for Dominion Affairs.

The Prime Minister stated that the present Government had come to the conclusion that "the existing organisation of the Colonial Office is no longer in correspondence with the actual Constitutional position in the Empire, and is inadequate to the extent and variety of the work thrown upon it. It fails more particularly to give sufficiently clear recognition to the profound difference between the work of communication and consultation with the self-governing partner nations of the British Commonwealth and the administrative work of controlling and developing the colonies and Protectorates for whose welfare the House is directly responsible." The Prime Minister therefore proposes that the conduct of affairs with the Dominions shall be under a separate new Secretaryship of State for Dominion Affairs, with its own Parliamentary Under-Secretary of State, who will also act as chairman of the Overseas Settlement Committee, and as Permanent Under-Secretary of State. For reasons of practical convenience Mr. Amery will combine the offices of Secretary for Dominion Affairs and Secretary for the Colonies, and the Department of Dominion Affairs will continue to be housed in the Colonial Office. These proposals will give effect to measures for which the self-governing Dominions have long pressed and the need for which has been fully recognised by the Imperial Parliament. Unfortunately practical difficulties have, up to the present, prevented the changes now proposed. The change recognises in constitutional form what has been the practice since the creation of a separate Dominions Department nearly a generation ago.

Mr. Amery, speaking at the dinner of the Corona Club emphasized that the proposal is something far more important than a mere concession to sentiment, since it is amply justified from the severely practical point of view. It will leave the Colonial Office free to devote its whole attention to the development of the dependent parts of the Empire, and the heavy burden of administration which this involves. These problems are already immense but are daily growing in volume and complexity. Mr. Amery expressed the opinion that we are on the eve of a period of great expansion and development in the Colonial Empire. The growing recognition given to scientific research, educational development and problems of health, among other problems, is evidence that every effort will be made to substantiate this view. The new Imperial Civil Research Committee is already at work discussing problems of Imperial development. *Ad hoc* Committees will be appointed for the purpose of investigating particular problems. Work of this kind has already been carried on by the Colonial Office, but it has become increasingly evident that its scope was inadequate.

BOOK REVIEWS.

"The Handbook of Sierra Leone." By T. N. Goddard, M.B.E., B.A., Oxon., Assistant Colonial Secretary, compiled and published by authority of the Government of Sierra Leone. pp. 331+xvi, $5\frac{3}{4}$ inch by $8\frac{3}{4}$ inch, 26 illustrations, 3 maps. Price 10*s*. 6*d*. net.

Though Sierra Leone occupies the proud position of Mother of our West African Colonies, she has been for too long regarded as the Cinderella of the West Coast. Like the young lady of the Fairy Tale, she is, however, coming into her own and already such epithets as "White Man's Grave" and "Devil's Post Restante" are no longer applicable to her territory, where Europeans can now live as healthily as in most other parts of the tropics.

In this substantial volume Mr. Goddard has co-ordinated many notes and articles contributed by Heads of Departments, with the result that much valuable information of an authoritative nature regarding Sierra Leone is rendered accessible. Of outstanding interest in this connection to readers of *Tropical Agriculture* will be the articles on "Lands, Forests, Agriculture and Live Stock" from the pen of Mr. M. T. Dawe, and the Section by Dr. C. J. Maxwell, C.M.G., on Land Tenure, which, as in other parts of West Africa, appears to be a complicated system based largely on the spoken instead of the written word.

In respect of Agriculture the system of "Shifting Cultivation" prevails. This, as Mr. Dawe points out, has been responsible for the wanton and wholesale destruction of high forests. When the soil becomes tired it is far less trouble to allow it to revert to bush for a few years and to open new land elsewhere than to resort to manuring or rotation of crops. Herein lies one of the weaknesses of the system of peasant proprietorship, but though tradition dies hard, native farmers are already more inclined to respond to the advice of trained Agriculturists than they were some years ago.

But it is on the exploitation of various products that Sierra Leone mainly depends for its prosperity. Palm kernels and palm oil represent the bulk of her exports. In 1923 the quantity of these two commodities reached the record figure of 62,891 tons while the value was £1,071,442, a figure which has only twice been exceeded in the Colony's history.

Sierra Leone has had a romantic history which the author traces from the first visit paid to the Peninsula by Hanno of Carthage—through the days of the slave trade and the settlement of liberated African Slaves by the Company whose Directors included William Wilberforce and Clarkson—through many vicissitudes—to the establishment of Crown Colony rule, and the author is to be complimented upon the mass of historical information which he has compressed within thirty-five pages. This history, is one of which Englishmen might well be proud, if they

were not so painfully ignorant. As a nation we are slow even now to appreciate the extent to which our responsibilities to the native races have been carried out by the splendid men of our Civil Service, as is admirably set out by the author in his historical summary.

Apart from its value to all connected directly or indirectly with Sierra Leone and to all who may desire information regarding the Colony and its resources and trade this Handbook should if it is properly circulated, prove of inestimable worth in calling attention to the Colony with which it deals.

ALGERNON ASPINALL.

"A GENERAL TEXTBOOK OF ENTOMOLOGY."—(Including the Anatomy, Physiology, Development and Classification of Insects) by A. D. IMMS, M.A., D.Sc., 698+xii pp. 607 text-figs. Methuen & Co., Ltd., London. Price 36*s.* net.

This work is announced as "intended to meet the present need for a comprehensive up-to-date general textbook of Entomology" and the author is to be congratulated upon his success in achieving this object. The subject is now so vast and the literature bearing upon it so widespread that any attempt at condensation into a book of reasonable dimensions must involve a great deal of selection, and in this Dr. Imms has shewn much thought and care. It is inevitable that certain sections should have been treated briefly. Some entomologists may well consider as unfortunate the necessary omission of a section on palaeontology, but the book taken as a whole is very well balanced.

The text is divided into three parts: I, Anatomy and Physiology; II, Development and Metamorphosis; III, The Orders of Insects. In the first part 156 pages are devoted to a consideration of the anatomy of insects in general and the functions of the various organs. The contents of Part II, comprising 42 pages, are indicated by its title. Part III occupies the remainder of the book and is a detailed account of the orders of insects, of which twenty-three are recognised. The Zoraptera and Psocida are dealt with as two sub-orders of the order Psocoptera; biting lice and sucking lice are considered each to be sub-orders of the "Anopleura"; the Megaloptera are included under the Neuroptera. For all these views there are good reasons. In treating of each order a general description of characteristics is given and this is generally followed by a key to all the principal sub-divisions of the order. In the majority of orders keys to the families appear and such greatly enhance the value of the book as a reference work. At the end of each chapter a good bibliography is appended.

The book is profusely illustrated and the figures are decidedly good. Printers errors are few. It is undoubtedly the best work upon the subject extant in the English language and it can be recommended unhesitatingly to the student.

C. L. WITHYCOMBE.

"TIMBER AND TIMBER PRODUCTS"—Including Paper Making Materials by S. J. DULY, London: Ernest Benn, Ltd. Price 21*s.*

This Book constitutes Volume II. of the "Resources of the Empire Series" other volumes of which have previously been reviewed in these columns. Each volume contains a foreword by His Royal Highness the Prince of Wales and a general introduction by Sir Eric Geddes, while the present volume contains, in addition, an introductory review by Lord Lovat.

Nothing could better exemplify the transient relationship which is so often apparent between politics and science. In 1920 Lord Lovat was (and still is) chairman of the then recently constituted Forestry Commission in the British Isles. In the same year Sir Eric Geddes the Chairman of the Committee whose recommendations gained notoriety as the "Geddes Axe," deliberately recommended the abolition of the Forestry Commission. In 1924 Sir Eric gives his blessing to a book in which prominence is given to the recommendations of the British Empire Forestry Conference. It may be conversion: one hopes it is not expediency.

The book contains little, if anything, that is original and is for all practical purposes a summary of the various reports submitted by the Forest Services of the Empire to the British Empire Forestry Conference of 1920 and 1923. To summarise these statements in one volume is primarily of value to the statistician and professional forester but it is hoped that the object of this book—"to bring in non-technical language before a wider public the results of the enquiries of the last few years into the Forest Resources of the Empire"—will be achieved.

Section I outlines in a few pages the Empire position as regards forest resources and the trade therein.

Section II gives detailed descriptions of each unit of the Empire, showing the extent of forest, species, utilisation, imports and exports. This section needs revision with regard to the Botanical names and shows too much evidence of hasty scissors and paste. The mahogany of British Honduras is not "*Swietenia Mahogani*" but "*S. Macrophylla*"; again in the same Colony, Cedar is shown as "*Cedrela Odorata*" instead of "*C. Mexicana Roem.*"

Section III is in many ways, the most interesting as it shows in less than a dozen pages the scope for the development of the forest resources of the various parts of the Empire. It ends fittingly by quoting the resolutions of the 1923 Empire Forestry Conference and it is hoped that at any rate pages 194-197, which contain these resolutions, will be studied with care by all who read this book.

Section IV gives a list of timber exporters and importers within the Empire, and a brief bibliography.

One of the points which must strike even the casual reader is the enormous number of kinds of timber which grow within the Empire and the very few which are known in trade. Surely there is use for other woods than teak, mahogany, &c.

R. C. MARSHALL.

SEXUAL PHYSIOLOGY.—By F. H. A. MARSHALL, F.R.S. pp. xii+167 Longmans Green & Co.

The author of this book holds an established position as an authority on the subject of which his larger volume "The Physiology of Reproduction" is the accepted standard work. The present volume deals with the subject in greater detail than is to be found in the ordinary text books on physiology and should appeal to many who cannot undertake a study of the larger work. Primarily written for Biological, Medical and Agricultural Students, it contains information of value to all who are concerned with breeding questions.

Function is referable to morphology and the structure of the human sexual organs are taken as type but throughout comparative references are made to a wide range of animals. Thus the description of the oestrous cycle is entirely generalised and the various forms which it assumes are referred to that generalisation. The powers of fertilisation and the development of the embryo is dealt with in a similar manner.

Of special interest are the chapters on Functional Secretions on Heredity and Sex and on Fertility which incorporate the latest views on these matters. They have an interest not merely to the student but to the practical breeder.

H. MARTIN LEAKE.

IN the *Transactions of the Turkestan Plant Breeding Station, Tashkent, No. 2*, appears a brief note by Dr. Zaitzev of a cross between two cottons one of which (*G. Herbaceum L.*) is of the Asiatic Group and the other (*G. Hirsutum L varlaciniata*) is of the American Group.

The two groups differ in the chromosome numbers which are 13 and 26 respectively and, with the exception of a doubtful case noted by Gammie, no instance of a cross between plants of the two groups is recorded.

On the assumption that the alien pollen tube grew more slowly in the tissue of a strange flower and therefore failed to reach the ovule before the style was shed, the staminal column was removed and fertilisation effected at the proximal end of the stigmatic surface. The species hybrid so produced was wholly infertile but the chromosome number exhibited by it is not stated.

H. MARTIN LEAKE.

"NATURE TEACHING." BY SIR FRANCIS WATTS, K.C.M.G., D.SC.—On behalf of the Imperial College of Tropical Agriculture the West India Committee will shortly publish a new Edition (the fifth) of "Nature Teaching" by Sir Francis Watts, the *Principal Emeritus*. Primarily intended for the guidance and information of the elementary and secondary school teacher the book, which was first published in 1901, has also made a strong appeal to the small agriculturist. The price of "Nature Teaching" will be 3*s*. 6*d*. net or 3*s*. 10*d*. post free and orders for it can now be sent to the Secretary (of the Imperial College), 14, Trinity Square, London, E.C.3.

COLLEGE NEWS.

The Session 1925-26 commences on Thursday, October 1st, 1925.

M. Majani, French Consul in Trinidad, paid a visit to the College accompanied by M. Georges le Févre, Envoyé Special du "Journal," M. Louis Roubaud, Conseiller du Commerce Extérieur, M. and Mme. Gauthier and M. Herti.

Mr. Milne-Home, accompanied by his mother, arrived from England by the S.S. *Intaba*. Mr. Ahmed Rifat, who has been nominated by the Egyptian Government, arrived by the same boat. Both students will commence their courses at the College on Oetober 1st.

Dr. Alfred F. Hess, of the International Health Board, visited the College on August 31st and several subsequent dates. It will be remembered that the Board recently made a generous gift of £1,000 a year for five years to establish a Chair of Tropical Sanitation and Hygiene at the College.

Mr. E. A. Seagar (Lecturer), Tropical Sanitation and Hygiene at the College, recently succeeded in passing the examination for the Diploma in Tropical Medicine and Hygiene. Mr. Seager is now working at the John Hopkins University, Baltimore, and will also visit Andalusia, in Georgia, with a view to studying the prophylaxis of tropical disease.

Major F. S. Parsons, B.S.A., Post-Graduate Student of the College 1924-25, has been appointed to the staff of the Empire Cotton Growing Corporation at Candover, Natal. Mr. Peat, B.SC., has been appointed assistant to Mr. Cameron in Southern Rhodesia. Mr. Cowland, B.A., has been appointed Assistant Entomologist and Mr. Marsland B.SC., N.D.A., N.D.D., Agricultural Inspector, in the Sudan.

WE have pleasure in announcing that, during the absence abroad of Viscount Burnham, the Duke of Atholl has kindly consented to act as Chairman of the Special Appeal Committee of the College. The First large donation received since he has "fathered" the fund is one of £1,000 from Messrs. J & P. Coats, Ltd. This generous gift, following closely upon the contribution of £1,000 from the Liverpool Cotton Association, is evidence of the continued interest of the cotton industry in the Imperial work of the College. In our next issue we hope to publish a second list of contributions to the Appeal for £100,000 launched by the late Lord Milner on behalf of the College. Contributions should be sent to the Secretary of the College, 14, Trinity Square, London, E.C.3., or to the Bankers of the Fund, the Colonial Bank, 29, Gracechurch Street, E.C.

The subscription to *Tropical Agriculture* is six shillings per annum, post free, to all countries within the British Empire or seven shillings, post free, to all other countries. Subscriptions can commence at any time during the year.

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—Prices have remained very steady at last month's figures. London futures are extremely stable showing nearly identical selling prices on a cash delivery basis for all months to the end of the year. Beet Sugar is cheaper. Prices on August 19th were, Cubes 35*s.* per cwt., Best Granulated 29*s.*, and West Indian Crystallized 27*s.* 6*d.*, all duty paid.

COTTON.—The United States of America Bureau crop report of 65·6 per cent. compared with the previous figure of 70·4 per cent. appeared "bullish" but, since the report, beneficial rains have fallen, and gratifying improvement is recorded, particularly in the South-western section of the belt. Prices declined to 13·11*d.* per lb. for Mid-American on August 20th. The undertone remain strong and the present decline is regarded as being of a seasonal nature.

CACAO.—Cacao is a firmer market and prices show a substantial advance over the same period last year. Closing prices on August 19th were, Ceylon Ordinary 105*s.* Trinidad Mid Red 76*s* Grenada Fine 65*s.*, and Accra Fermented 43*s.*, each per cwt., spot, London.

COFFEE.—The market is quiet. Costa Rica Middling at 164*s.* and Brazil Santos at 103*s.* have both remained steady, but East Indian Mysore Middling has fallen to 136*s.*, and Kenya Good Middling to 130*s.*, each per cwt., London, on August 12th.

TEA.—Tea has declined in price since our last report, averages on August 19th being,, Ceylon 18·30*d.*, Indian 15·04*d.*, Java 11·60*d.*, each per lb.

SISAL AND HEMP.—After the sharp rise recorded last month Hemp has fallen in price, realising £43 on August 19th compared with £49 on July 15th. Sisal, on the other hand, has recovered tone and sells quite well at £46 10*s.*

RUBBER.—Prices have declined from the very high levels recently experienced, largely owing to the small demand from America. Stocks in London on August 15th amounted to 5,096 tons. Spot Sheet realised 3*s.* 8½*d.* in London on August 19th.

COPRA.—Prices in London have remained firm but the volume of business has not been great. Marseilles is reported to be buying kiln-dried copra very freely. Prices recorded on August 19th were, F.A.Q. Ceylon to London £32 2*s.* 6*d.*, Sun-dried Straits to Rotterdam £30 7*s.* 6d. and Straits to Marseilles £30 each per ton.

PALM KERNELS.—The market is firm and prices have touched 22*s.* 6*d.* per cwt. Futures show remarkable uniformity.

GROUND-NUTS.—Prices have remained fairly level, Nigerian ground-nuts fetching £25 10*s.* per ton, Indian £24 10*s.* and Senegal £20, all on August 19th.

FERTILIZERS.—Nitrate of Soda and Nitrate of Lime are in increased request but the market for other types has remained dull. Prices have remained very steady during the last three months. Prices on August 12th were, Nitrate of Soda 12*s.* 9*d.*, Sulphate of Ammonia 12*s.* 3*d.*, Sulphate of Potash 11*s.* 6*d.* and Nitrate of Potash 7*s.* 3*d.* each per cwt.

INDIAN TEA.

AT the 45th annual general meeting of the Indian Tea Association of London the agreement to abolish forward sales was referred to with satisfaction. The Indian tea industry is now taxing itself to the extent of £90,000 per annum for the purpose of developing markets. It was urged that the maintenance of a high standard of tea would form one of the best supports for the propaganda work which is being carried on in America and France. In the spring of this year attention was called to the disappointing quality of the teas during the latter part of 1924, and proprietors were recommended to improve the quality of the 1925 crop " by producing teas of a standard to meet present-day requirements and by avoiding the manufacture of coarse and stalky teas."

For the current year £40,000 had been set aside for propaganda in the United States, mainly for the purpose of newspaper advertising, as this form of advertising is calculated to reach the greatest number of potential consumers. During the year 1924, while the imports of all kinds of tea decreased by 4,000,000 lb., the imports of Indian and Ceylon teas increased by over 7,000,000 lb. Most leading firms report an increase in sales of British grown teas and a decline in all unfermented or semi-fermented teas. It is felt that prohibition materially assists the campaign and that full advantage should be taken of the opportunity offered. The plan of campaign is to concentrate each year in the largest American cities in turn until 1927-28 when two-thirds of the allotment will be devoted to advertising throughout the whole of the United States. Slow but steady progress is being made in France where consumption has increased from 2,475,000 lb. in 1921 to 3,654,000 lb. last year. Propaganda is financed by a voluntary cess of 6 annas per 100 lb.

All communications relating to *Tropical Agriculture* should be addressed to the Editor, *Tropical Agriculture*, The Imperial College of Tropical Agriculture, St. Augustine, Trinidad, B.W.I.